Education
L
11
E24

EDUCATIONAL METHOD

JANUARY, 1937

Looking Ahead in Arithmetic

One Hundred Per Cent in the Fundamentals

Functional Arithmetic

Published by The Department of Supervisors and Directors of Instruction of the National Education Association of the United States

VOLUME XVI NUMBER 4

PROPERTY OF
GRAND RAPIDS PUBLIC SCHOOLS

EDUCATIONAL METHOD

OFFICIAL ORGAN, DEPARTMENT OF SUPERVISORS AND DIRECTORS OF INSTRUCTION
OF THE NATIONAL EDUCATION ASSOCIATION OF THE UNITED STATES

JAMES F. HOSIC, *Editor*
MARY F. HAZELL, *Assistant Editor*

Associate Editors
WILLIAM H. BURTON
MILDRED ENGLISH
J. CAYCE MORRISON
F. M. UNDERWOOD

Special Editors, 1936-1937
December: A. H. MOEHLMAN
January: GUY M. WILSON
March: WALTER BARNES
May: ROSE LAMMEL

Vol. XVI CONTENTS FOR JANUARY, 1937 *No. 4*

LOOKING AHEAD IN ARITHMETIC	*Guy M. Wilson*	163
WHEN SHALL SYSTEMATIC INSTRUCTION IN ARITHMETIC BEGIN?	*Clifford Woody*	165
FUNCTIONAL ARITHMETIC	*Carleton Washburne*	167
ONE HUNDRED PER CENT IN THE FUNDAMENTALS	*Margaret E. Sweeney*	170
STANDARDIZED TESTS IN ARITHMETIC	*Louise Beattie*	175
TEACHING DENOMINATE NUMBERS AND MEASURES	*Dorothy W. Wilson*	177
CORRECTIVE ARITHMETIC IN JUNIOR HIGH SCHOOL	*Joseph H. Randall*	182
ELIMINATING THE TEXTBOOK PROBLEM	*Helen Allphin*	186
EXPERIMENTING WITH REAL SITUATIONS IN THIRD GRADE ARITHMETIC	*Henry Harap and Ursula Barrett*	188
DEVELOPING NUMBER CONCEPTS WITH YOUNG CHILDREN	*Laura Hooper and Barbara Stratton*	193
A STUDY OF ISOLATED PROBLEMS OF FOUR TEXTS	*Grace E. Janes*	198
CHOOSING A TEXTBOOK IN ARITHMETIC	*Jane Brooks*	200
ARITHMETIC "ON ITS OWN"	*Mattie Graham*	202
A PRACTICAL PROBLEM UNIT IN ARITHMETIC	*Lola Coffey*	205
THE PURPOSE OF ARITHMETIC	*Josephine L. Driscoll*	208
THE CLEARING HOUSE		211
EDITORIAL COMMENT AND REPORT		213
THE READER'S GUIDE		218

EDUCATIONAL METHOD is published monthly from October through May, for the officers, directors, and members of the Department of Supervisors and Directors of Instruction of the National Education Association. Editorial and executive office, 1201 Sixteenth Street, N. W., Washington, D. C. The subscription price is $3.00 a year, single copies, 35 cents; special numbers, (December, January, March, and May), 50 cents.

Postage is prepaid on all orders from the United States, Mexico, Cuba, Porto Rico, Panama Canal Zone, Republic of Panama, Bolivia, Colombia, Honduras, Nicaragua, Peru, Hawaiian Islands, Philippine Islands, Guam, and the Samoan Islands. Postage is charged extra as follows: Canada, 30 cents on annual subscriptions; other foreign countries not named, 50 cents. Entered as second class matter at the Post Office at Washington, D. C., under the Act of March 1, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized August 13, 1924.

THE DEPARTMENT OF SUPERVISORS AND DIRECTORS OF INSTRUCTION OF THE

NATIONAL EDUCATION ASSOCIATION OF THE UNITED STATES

1201 Sixteenth Street, N. W., Washington, D. C.

OFFICERS, 1936–1937

President, RUDOLPH D. LINDQUIST, Director, The University School, Columbus, Ohio.
First Vice-President, MARY BROWNING, Supervisor of Primary Grades, Louisville, Ky.
Second Vice-President, ROBERT H. LANE, Assistant Superintendent of Schools, Los Angeles, Cal.
Secretary-Treasurer, JAMES F. HOSIC, Professor Emeritus of Education (Columbia University), 1201 Sixteenth Street, N. W., Washington, D. C.

EXECUTIVE COMMITTEE

The officers of the Department, *ex officio*
MILDRED ENGLISH, Superintendent, Peabody Training School, Georgia State College for Women, Milledgeville, Ga.
ERNEST HORN, Professor of Education, State University of Iowa, Iowa City, Ia.
PAUL T. RANKIN, Supervising Director, Curriculum and Research, Detroit, Mich.

BOARD OF DIRECTORS

MARY BROWNING, Supervisor of Primary Grades, Louisville, Ky.
HOLLIS L. CASWELL, Division of Surveys and Field Studies, George Peabody College for Teachers, Nashville, Tenn.
PRUDENCE CUTRIGHT, Assistant Superintendent of Schools, Minneapolis, Minn.
ELSIE A. DAVIS, Supervisor of Elementary Education for Fairfax County, Fairfax, Va.
DESSALEE R. DUDLEY, Assistant Superintendent of Schools, Battle Creek, Mich.
MILDRED ENGLISH, Georgia State College for Women, Milledgeville, Ga.
JULIA L. HAHN, Supervising Principal, Third Division, Washington, D. C.
HELEN HEFFERNAN, Chief, Division Elementary Education and Rural Schools, Sacramento, Cal.
JAMES F. HOSIC, 1201 Sixteenth Street, N. W., Washington, D. C.
RUDOLPH D. LINDQUIST, Director, The University School, Columbus, Ohio.
WILLIAM T. MELCHIOR, Professor of Education, Syracuse University, Syracuse, N. Y.
J. CAYCE MORRISON, Assistant Commissioner for Elementary Education, Albany, N. Y.
ELMA A. NEAL, First Assistant Superintendent of Schools, San Antonio, Tex.
LUCILLE NICOL, Assistant Superintendent of Schools, New York, N. Y.
MABEL C. O'DONNELL, Primary Supervisor, Public Schools, East Side, Aurora, Ill.
HELEN J. PIPER, Supervisor of Grades 4–6, Lynn, Mass.
LEONARD POWER, 417 Riverside Drive, New York, N. Y.
PAUL T. RANKIN, Supervising Director, Curriculum and Research, Detroit, Mich.
FRANKLIN M. UNDERWOOD, Assistant Superintendent of Schools, St. Louis, Mo.

MARY F. HAZELL, Executive Secretary, 1201 Sixteenth Street, N. W., Washington, D. C.
WILMA LESLIE GARNETT, Chairman of Promotion Committee, Eastern State Normal School, Madison, S. Dak.

MEMBERSHIP

All persons who are interested in the work of the Department of Supervisors and Directors of Instruction and desire to support it are invited to apply for membership. The annual dues are $4.00. This entitles the member to receive EDUCATIONAL METHOD for a year and also the Yearbook.

Vol. XVI JANUARY, 1937 *No. 4*

EDUCATIONAL METHOD

LOOKING AHEAD IN ARITHMETIC

GUY M. WILSON

School of Education, Boston University, Boston, Massachusetts

Looking back, we see that the arithmetic of today has come from more than one source and by routes often circuitous and difficult. Early arithmetic in America was not a part of the program for the cultured and educated. It was left to tradesmen and those engaged in commerce or practical affairs. The élite regarded arithmetic as "vile," "mechanic," and fit only for those not capable of higher learning. For years, arithmetic was not required for college entrance; Yale made it a requirement in 1745, Harvard, in 1804.[1]

Arithmetic as a practical subject developed in northern Europe with the development of commerce and cities, following the dark ages. The Hanseatic League required accountants and bookkeepers, for whose training they needed teachers or "reckoning masters." The Dutch West India Company brought arithmetic to New Amsterdam (New York) as early as 1636,[2] where it was emphasized as a practical subject for those engaged in trade and commerce.

While the schools, particularly those preparing pupils for college, neglected arithmetic for a century or so, it was inevitable that arithmetic should sooner or later become a school subject in our country. All men in America were engaged in making a living and therefore were interested in trade and industry. Even the gentry of Virginia were farmers and merchants. Washington kept his own books and accounts, as did Jefferson.

When textbooks in arithmetic began to appear, an element other than the practical came into the subject, viz., cultural and disciplinary values. Greek culture and monastic leisure had developed a science of number and many of the puzzle possibilities of number, quite apart from practical considerations. Gradually cultural and disciplinary considerations largely replaced practical considerations. But this took time and a new type of author, viz., the teacher or professor with the purely academic viewpoint.

Early arithmetics in the colonies were intended as practical guides to tradesmen. They endeavored to cover all trade needs with illustrative problems, most of which were solved. Pike's *New and Complete System of Arithmetick* contained 1224 problems, 660 of which were solved. This was as late as 1808. The idea was to provide a

[1] See Monroe, Walter S., "Development of Arithmetic as a School Subject." *Bulletin No. 10*, 1917, U. S. Bureau of Education.

[2] Kilpatrick, W. H., "The Dutch Schools of New Netherlands and Colonial New York." *Bulletin No. 12*, 1912, U. S. Bureau of Education.

PROPERTY OF
STATE NORMAL SCHOOL

cyclopedia of arithmetic to which a tradesman might refer for any situation or process needed.

But when the schools took over textbooks in arithmetic, the solutions were omitted. Thus we had the indefensible situation of little children being required to figure in a wider variety of businesses than any one business man would ever need and, moreover, children had to do this figuring without any knowledge or judgment as to the business involved, a difficulty which adults do not have.

Furthermore, the academic-minded author developed processes far beyond usage. Ordinary adult adding seldom involves more than five addends or more than three places, but children were led far beyond these limits. Adults, aside from the technically trained, seldom use decimals except to read them, but children were required to add, subtract, multiply, and divide decimals. Even in big business, the ordinary worker has little use for denominate numbers; no reductions (these are done by the engineering department or cost-accounting department); no addition, subtraction, multiplication, or division of compound numbers; no tables to be committed. Yet the child is required to do all these things, and do them, moreover, on a drill basis.

Drill in many schools was carried through ratio and proportion, square root, and sometimes cube root and mensuration. Thus, while the adult had use for only the simplest sort of arithmetic—chiefly the fundamentals—children, either for cultural or for disciplinary purposes, or in order to broaden their concepts of the number system (a justifiable interest on an appreciation basis, sometimes), were forced to attempt an impossible load. It meant not only defeat from the very beginning, but also that the essential tool materials were not mastered.

Within the last few years there has been a strong urge for a more practical and sensible view in arithmetic. Studies of adult usage have focused attention upon arithmetic as a simple tool subject comparable to reading and spelling, and the load is reduced accordingly. Looking into the future, we may reasonably hope for the time when drill will be omitted from the arithmetic of grades one and two, possibly three; when the purpose of arithmetic during the first three years of school life will be the extension of experience and the development of meaning; when through simplification of the drill program we may expect perfect or 100% mastery of the simple tool processes; when the isolated written problem of the textbook will be entirely eliminated, being replaced by experience situations calling for figuring and business judgment exactly as in life.

The fact that the needed changes in arithmetic, indicated in the last paragraph, have come so slowly is not a compliment to the teaching profession. Such changes have come in spelling: the 10,000 to 15,000 word list has been generally replaced by a word list not exceeding 3,000 to 4,000. In reading, the child is no longer expected to articulate words far beyond his understanding. Similar changes are under way in arithmetic. The defensive towers of mental discipline are crumbling; meaningful work for children and for life will in time be recognized as the proper program of work in elementary arithmetic. With this simplified program, if accompanied by better teaching, the child may daily experience the joys of success in meaningful work.

WHEN SHALL SYSTEMATIC INSTRUCTION IN ARITHMETIC BEGIN?

CLIFFORD WOODY

University of Michigan, Ann Arbor, Michigan

The answer to this question depends upon the circumstances. After surveying all of the evidence, the writer has concluded that such instruction should be postponed as long as possible. In most schools formal instruction in the subject is given at the beginning of Grade II. The writer, however, would postpone it, if possible, until the beginning of Grade III. In arguing for postponing the beginning of organized and systematic instruction until the beginning of Grade III, the writer is not contending that no arithmetic shall be taught previous to that time nor is he asserting that children have not sufficiently matured to profit by such instruction.

Before that time, instruction in arithmetic should be given in connection with the needs of the children. They will have need for arithmetic in keeping score in their plays and games; need for measurement in construction work; need for counting, measuring, and weighing, reading and writing numbers, telling time, and other such aspects of arithmetic and arithmetical processes in connection with the school activities in which they are engaged during the first two years in school. The teacher, during this period, should give in an informal manner whatever arithmetic is needed to meet the purposes at hand. Such instruction will be meaningful for it will be given in response to the child's need for achieving a given purpose. Such instruction is not only meaningful but it is also functional.

The first two years of the school life of the child should be for the purpose of having meaningful experience rather than for the purpose of fixing number facts and processes. Let the child engage in all sorts of number experiences involving counting; weighing with various types of scales; measuring with foot rule and yardstick, with pint, quart, and gallon containers; playing with clock faces and speedometers; or playing dominoes, parchesi, and lotto. Let the child discover in this way the meaning of numbers and the relationship of numbers. The instruction in these number experiences should approximate that usually given by parents to their children when the latter ask for assistance in connection with some play activity. The intelligent parent will cause the child to depend upon himself for whatever calculations are within his powers, and will show him how to do the others in order that the play activities may progress without much interruption. This type of process is exactly the one pursued by Harap and Mapes[1] in their teaching of fractions in Grade II. The results obtained by MacLatchy and Buckingham and Woody all show that pupils will master the processes of arithmetic through these methods, that they will have an understanding of the processes, and that they will

[1] Harap, Henry, and Mapes, Charlotte E., "The Learning of Fundamentals in Arithmetic Activity Program." *Elementary School Journal*, 34: 515-525 (March, 1934).

PROPERTY OF
GRAND RAPIDS PUBLIC SCHOOLS

experience much satisfaction in number manipulation. A study reported by Wilson [2] shows no loss through omission of drill from grades I and II.

The writer believes in the postponement of the formal instruction in arithmetic because such postponement offers much opportunity for the development of meaningful number experiences and allows the use of the time ordinarily devoted to the formal teaching of arithmetic in grades I and II to be given to reading, language, or play activities. He does not argue for postponement because of the child's immaturity or inability to learn the mechanical processes. The Buckingham, MacLatchy, and Woody studies reveal that the children all possessed a surprising amount of knowledge of the fundamental processes of arithmetic. When the knowledge of arithmetic is essential in meeting a given purpose, the child soon learns the needed arithmetic. But children can learn arithmetic unrelated to their needs. Witness the results achieved in the early schools of America or the school of modern days in Scotland, in which formal instruction is introduced at the beginning of Grade I. MacGregor,[3] in discussing the superiority of achievement in the schools of Scotland, asserts that this superiority is due to the fact that children enter school in Scotland one year younger than in America. The point is that children can and do learn the processes of arithmetic up to a certain level in grades I and II with or without formal instruction; but the writer contends that the child with a two-year period in which emphasis is placed upon the development of number experiences will master the arithmetical processes more effectively, with greater understanding, and with less effort than the child who is launched at once into drill on the arithmetical processes.

While the writer believes in the postponement of formal instruction in arithmetic till the beginning of Grade III, he realizes that circumstances may necessitate an earlier introduction of formal procedures. If teachers have a poor understanding of the psychology underlying the processes of arithmetic, it may be expedient to begin formal instruction much earlier. Teaching arithmetic as outlined in the preceding paragraphs requires a good teacher; a poor teacher almost invariably resorts to formality in teaching, for if he does not know what else to do, he can always resort to formal drill. It may be that this is wise, for if the poor teacher does not begin formal instruction in the early grades, he may do something worse. Again, if the community attitude is such that it insists on the early introduction of systematic study of arithmetic, it may be well to cater to this desire. But if the quality of teaching will warrant it, and the attitude of the community is favorable, there is nothing in the scientific investigations which will condemn postponement of formal teaching of arithmetic.

[2] Wilson, Guy M., "New Standards in Arithmetic." *Journal of Educational Research*, 22: 351-360 (December, 1930).
[3] MacGregor, Gregor, *Achievement Tests in the Primary School*. London: University of London Press, 1934.

FUNCTIONAL ARITHMETIC

CARLETON WASHBURNE

Superintendent of Schools, Winnetka, Illinois

We need no further proof of the failure of mathematical training to transfer automatically into practical, applied logic than the examples furnished by the mathematicians and arithmetic specialists themselves in the textbooks and curricula they prepare. They jump like grasshoppers from one set of assumptions to another, and appear to have no clear, consistent, and logical basis for what is included and what is left out. This applies to every arithmetic textbook I know of, including those I myself have helped to write, and to every arithmetic curriculum I have seen. Isn't it time we cleaned house, examined our premises, and refurnished our books and courses with consistently selected material?

Our problem is to agree on a criterion of selection. Up to now we have had a jumble of criteria and have used none of them whole-heartedly.

There's the old formal discipline theory, for example, discussed to exhaustion, but not yet wholly dead. Very few educators or elementary teachers openly defend it, but one suspects it of lurking in the background of their thinking when one examines their curricula—it would be very hard otherwise to defend some things they teach. Since, however, this article is not addressed to high school teachers of mathematics (who almost have to cling to the formal discipline notion if they are not to feel like parasites) and since elementary teachers and makers of arithmetic curricula and texts seldom confess they are influenced by this vestigial criterion, I shall not pause to discuss it.

Next, there's the criterion of preparation for all contingencies—the child *might* need the knowledge some time. If he becomes an engineer, he'll need some things; if he's a hardware merchant, he'll need others—double discount, for instance, and fractions of a gross. If he's a farmer, he'll need rods and maybe square rods; if he's a cistern contractor or a silo manufacturer, he'll need volume of cylinders—and so on. This is, I believe, the most prevalently used criterion—our books are jammed with material otherwise unjustifiable. How else, for example, can square root and area of a circle be justified? Or the addition, in one column, of such fractions as $\frac{3}{8}+\frac{2}{3}+\frac{5}{6}$? Or case III percentage? The child *might* some day need any one of these things. This basis of selection seems reasonable, if we don't examine it logically. But a moment's thought on the subject shows the impossibility of carrying it to a logical conclusion. The amount of arithmetic that *might* be used—or that actually is used by all vocations and avocations combined—is hopelessly large. So we drop troy weight and apothecaries' weight, and wall-papering and carpeting problems, and areas of trapezoids; but we leave in $\frac{1}{3} \div \frac{3}{4}$, and $.008 \times .0008$, and a hundred other equally useless items—useless, that is, to most of the children either now or in adult life.

A third criterion is closely related to this second one, and is usually resorted to when the impracticability of that is pointed out. This is the criterion of "it won't hurt him to know it." This sounds so plausible!

But where do we stop? What individual item of knowledge will hurt a child? No curriculum can be built on this foundation—it would be like building a house all over the state. Furthermore, it does hurt a child to require him to learn arithmetic for which he can see no use or application—it wastes his time, it destroys his interest, it confuses his mind with a medley of meaningless abstractions and thereby inhibits clear, sensible thinking on the functional parts of the curriculum.

Driven from this justification for including useless but traditional material, the grasshopper logician jumps to another straw—"we have to overtrain the child so he will retain a part of what we teach"—teach him to multiply

$$\begin{array}{r} 30607 \\ \times 9020 \\ \hline \end{array}$$

so that he will be able to multiply

$$\begin{array}{r} 230 \\ \times 72 \\ \hline \end{array}$$

and teach him to get $\frac{7}{16} \times 1\frac{2}{25}$ so that he can find $\frac{1}{2} \times \frac{1}{3}$. The trouble is that we take him out of the realm of the real into the realm of the meaningless. A child can envisage $\frac{1}{3}$. He can see what $\frac{1}{2}$ of $\frac{1}{3}$ is. He can see that if a recipe calls for $\frac{1}{3}$ of a cup and one is making half the recipe, the operation is useful. But what child sees any sense in $\frac{7}{16} \times 1\frac{2}{25}$? Instead of over-training him, we merely confuse him and train him to juggle numbers without any possibility of using them.

Why do we suppose children need over-training? Simply because we've tried to train them in so much meaningless, abstract material. We don't have to make children read abstruse scientific journals in order to give them fluency in everyday reading; reading is *used* all the time and it sticks without over-training. If we teach only useful arithmetic, and teach it concretely and interestingly, we don't need to over-train.

Next, there is Judd's pet criterion—the basic importance of the Arabic number system. Of course it's important—so important that it plays into every speck of functional arithmetic and can be taught without having to resort to non-functional material. It's so broad that it can't be used as a criterion for selection—it lets everything in. But the understanding of it is enhanced, not diminished, by confining ourselves to numbers within the child's experience. $.002 \div 3.02$ is wholly out of the child's life and he gets no real concept of numbers or decimals when he applies, mechanically, a seemingly meaningless rule to get an answer that cannot have any meaning to him, and does it for no reason in the world. How can anyone show him that he might some day want to divide .002 into 3.02 parts?

How about preparation for high school? Fortunately, the high school doesn't expect its students to know a fraction of what the elementary school teaches in upper grade arithmetic. Even if the high school did expect it, it would be disappointed, for children inevitably forget the abstractions which have been stored away, unused, only to evaporate. Ask any physics or chemistry teacher how much has stuck. But even if it would help those teachers, that fact would not justify our retention of such items. The time to teach them economically would be in direct connection with their application to physics and chemistry, not in a vacuum, to immature children, years before they can be applied.

What, then, should we include? I think there is only one criterion that we can apply consistently: teach all children only that which we know all children will use. This does not preclude vocational courses—it implies rather that all children who are going to follow a vocation that requires a given body of arithmetic should learn that material. Nor does it preclude electives in arithmetic where the mathematically-

minded youngster may explore numbers and number relationships *ad lib*—such children are using their arithmetic culturally or avocationally and from some of them will come new uses and new methods. I would even favor an *exposure* of all children in the upper grades to occasional excursions into the field of number and quantity, as things interesting in themselves, but this exposure would involve no drills, assignments, marks, tests, or failures. It would be for the purpose of finding out what children might like to do elective work, and for stimulating those with a special bent to develop it, insofar as they have time and there are not other electives which are more important for them.

The required course for all children can, logically, consist only of what all children will use. How do we know what they will use? We should have much more research on this, but, practically, the things everyone uses are pretty obvious even without research. A good motto is, "When in doubt, throw it out." The burden of the proof should always be on including a given topic, not on excluding it.

Even those who grant that general usefulness is the only legitimate criterion, however, have their own pet inconsistency. It's the one I've been guilty of in my own texts and schools. We recognize a *process* as useful, and then assume that all the ramifications of that process are, *ipso facto,* useful too. That's how .008 × .0008 got into my course—and similar examples got into every other course I've ever seen. Surely children will use some multiplication of decimals (mostly dollars and cents, however); so we agree to teach this process. What's involved in the process? Decimals in multiplier and decimals in multiplicand. What are the difficulties? Among them is the supplying of noughts in the product to get the necessary number of places. So we reach our preposterous example cited above.

In reforming, I've found a very useful rule of thumb, research being scanty: ***Never include in any drill material an example that you cannot put into a realistic story problem.*** And I define a realistic story problem as one which depicts a situation familiar to all the children, one in which each child can readily see that he is likely to find himself, and one in which, were he to be the principal character, he would have to do what the problem asks him to do. Let me illustrate.

> A boy bought a set of stamps. He sold them for 50 cents. This was 10 cents more than he paid for them. How much did he pay for them?

This seemingly realistic problem is bad. The situation, it is true, is familiar to most children—stamp collecting is so common that, even if one is not a collector, he has friends who are. The child can readily imagine himself in the situation and see that he is likely to be in it or an analogous one. But if he were in it, he would not have to do what the problem calls for—he would necessarily know what he paid for the stamps before he knew what his gain was.

Textbooks have made great strides in recent years in making their problems realistic, but almost all of them slip up either in the way just illustrated or in taking situations which are not familiar to more than a fraction, if any, of the children. Yet enough progress has been made so that most of us could apply the rule of thumb—we know what a realistic problem is and we can see what drill exercises can be fitted into such problems. I dare anyone to get truly realistic problems in which the principal character needs to add: $\frac{3}{4}+\frac{2}{3}+\frac{5}{6}+\frac{1}{9}$; or where he has to multiply .008 × .0008, or divide $\frac{1}{3}$ by $\frac{3}{4}$. Or try to find problems that are realistic within the definition given, including the likelihood of the child finding himself in the situation depicted, that will call for square root, for finding the

area of a circle, for changing rods to miles, or cubic inches to cubic feet, and so on indefinitely. Once one begins to apply this functional criterion to any text or any course of study, one is appalled by the amount of useless junk we are trying to cram down children's throats. Anyone can see why arithmetic, although taking the lion's share of the child's (and teacher's) time—more than any other subject—results in more school failures (above first grade) than does any other subject.

Yet what a howl we let out as our pet examples, exercises, processes, etc., are eliminated. We struggle desperately to hang onto them by hopping back to the other criteria, one after another—anything is better than simplifying arithmetic to the point of usefulness, to the point where teachers can teach it and children can learn it painlessly, realistically, functionally. Never mind logic—we aren't expected to transfer our mathematical training into the field of curriculum building and textbook writing. What difference does it make what we teach the children so long as it's hard?

ONE HUNDRED PER CENT IN THE FUNDAMENTALS

MARGARET E. SWEENEY

Principal, Gridley Bryant School, Quincy, Massachusetts

[The 100% plan was at first a mere ideal. It was at the Gridley Bryant School, under the direction of Miss Sweeney, that one of the first experiments with the ideal was carried through. Evidence here and elsewhere has made possible the substitution of a plan for an ideal. This article will bear careful study. —The Editor.]

It was my privilege to help in developing the 100% plan in its early stages through an experiment in long division in grades V and VI in 1929. There were 70 fifth grade pupils and 38 sixth grade pupils who completed the experiment; of these, 62 fifth grade pupils and 36 sixth grade pupils made 100% scores on a final test. The class mean rose for the fifth grade from 82.8% to 98.4%, and for the sixth grade from 88.4% to 93.3%.

The 100% ideal has been one of slow and gradual growth. McMurry, as early as 1903, suggested before the National Education Association that many of the processes in arithmetic were relatively useless. Many others had made similar arguments, but they were accepted only as arguments. However, in 1918 there appeared an objective study [1] of adult usage of arithmetic which could not be argued down. This study revealed a surprising simplicity of the arithmetic of general adult usage. Naturally the conclusions were doubted. Wise,[2] duplicating the study with a larger geographic spread, may have expected to find different results. Actually, however, the tables on a percentage basis were practically duplicates of Wilson's tables. Woody, Thorndike, Charters, Bobbitt, and others followed with various types of objective studies.

Thus it was established on an objective basis that approximately 90% of adult figuring is in the fundamental processes. The question naturally arose, therefore: Should not these processes be taught to the point of absolute accuracy?

[1] Wilson, G. M., *Social and Business Usage of Arithmetic.* Teachers College Contributions to Education, No. 100.
[2] Wise, Carl T., "Arithmetic Problems Arising in Various Occupations." *Elementary School Journal,* October, 1919, p. 118.

During 1924-25, there was carried on in New England a coöperative testing program in arithmetic among school children. It was found that the percentage of children who made perfect scores on very simple tests in the fundamentals was so low as to cause concern. When one-third of sixth grade children failed to make perfect scores on an exceedingly simple test in addition, superintendents were justified, when called into conference, in raising the further question: Is it possible to prevent failure?

The development of a plan to prevent failure called for further coöperative studies. These were carried out chiefly by students who were at the same time teachers in the public schools. It was found: (1) that any successful plan in arithmetic had to be deferred until there was sufficient interest and maturity; (2) that the steps of the process had to be limited in number and therefore in general confined to the essential steps; and (3) that the necessary time for complete mastery needed to be found. The omission of useless processes provided the necessary time.

One great factor of difficulty has been the failure of teachers to grasp the 100% ideal. For generations we have accepted a grade of 75 or 80% as a passing grade. In terms of pupils with perfect scores, a 75% grade for a group means that about 40% of them make perfect scores. In other words, we had been permitting 60% of the children to go along with errors in their basic tool arithmetic work.

Demonstrations became an important part of the work of setting up this 100% ideal and the development of a plan. My own study in long division already referred to was one of them.[3] Other studies with similar purpose followed. In a number of coöperating centers,[4] there was experimentation with the 100% plan.

The 100% ideal requires perfect automatic response on the fundamental facts and processes. With automatic response there is no time for counting or silent repeating of tables. Every teacher can secure perfect scores in the four fundamentals. It is an easy task if the children are thoroughly interested, and if the teaching is carefully and thoroughly done on a helpful basis. At all times the teacher's program should be preventive rather than remedial.

Children should master certain fundamental number relations before they are permitted to advance. The children should feel that the teacher has confidence in their abilities and that nothing less than 100% accuracy is desirable. Tremendous possibilities of improvement have been shown by the many experiments that have been tried. They show that accuracy and speed can be advanced to the 100% line under ordinary classroom conditions.

One study [5] showed that, in a fourth grade of 60 pupils, on a first trial test in addition there were 1,160 errors and no 100% scores; on second trial three months later, after careful teaching, there were only 289 errors and 18 pupils had perfect scores. In a fifth grade of 61 pupils, on the first test in addition there were 1,128 errors and no 100% scores; on the second trial, after three months of careful teaching, there were only 48 errors and 46 pupils had 100%.

Another study [6] in addition showed that in a third grade of 169 pupils, on first trial two pupils had 100%, but on the second trial after teaching, 138 pupils obtained 100%. In a fourth grade of 164 pupils, on the first trial two pupils had 100%, but on

[3] Sweeney, Margaret, "An Effort at 100% Results in Long Division in Grades V and VI." Master's Thesis, Boston University, 1929.
[4] Lynn, Newton, Quincy, Belmont, Everett, Revere, Melrose, and other towns and cities in New England.
[5] Burgess, B. M., "100% Results in Addition and Multiplication in Grades IV and V." Master's Thesis, Boston University, 1930.
[6] Hammond, W. E., "Securing 100% Accuracy in the Fundamentals." Master's Thesis, Boston University, 1930.

the second trial, after teaching, 159 pupils had 100%.

The experiment of Elizabeth Greenwood, Primary Supervisor of Lawrence, Massachusetts, indicated the possibility of 100% results in the primary addition facts for young pupils, and that these results are accompanied by a happier childhood through coöperation, understanding, and success.[7]

A high degree of intelligence above normal is not a requisite to 100% accuracy. Intelligence helps, but is not a controlling factor. All normal children should be able to secure perfect scores. In order to reach this 100% ideal, what are the requisites?

1. An adequate and systematic drill service, aiming at complete mastery of facts and process steps.
2. A teacher to understand and follow the plan of the drill service with the idea of systematic procedure, step by step, regular check-up through inventory tests, followed by reteaching, reviews in the form of application in useful situations, games and motivated competition, and the final aim of 100% from each and every normal child.
3. One process undertaken at a time, systematically taught.
4. A realization that poor teaching is a greater handicap than dull children and that the 100% ideal is the only acceptable standard.

Where should be the grade placement of useful drill in order to attain the 100% ideal? This is a serious question. For the past six years the writer has been obtaining some very gratifying results by following this program:[8]

Grade I

Lead the pupils through a series of experiences. These experiences should be such as to build up an understanding of the meaning of number and some of the resulting language of number.

Grade II

In this grade and in the remaining grades the experiences should be such as to build up a consciousness on the part of the pupil that the time spent in school is a part of life. These experiences should be closely correlated with the expanding interests of the pupils.

1. *Addition,* based upon successive groups of facts.
   a. 100 primary facts.
   b. Short columns.
   c. Short columns with zero.
   d. Two- or three-place addends.
   e. One-, two-, and three-place addends, zeros, and gaps.
2. *Subtraction.*
   a. 100 primary facts.
   b. Simple subtraction, without adjusting.
   c. Simple subtraction, no adjusting, zero in answer.
   d. Simple subtraction, no adjusting, last subtraction a zero brought down.
   e. Gaps—no adjusting.

Grade III

3. *Addition.*
   a. Review fundamental facts daily (5 minutes).
   b. Related facts.
   c. One-, two- and three-place addends and carrying, sum of lefthand column less than 10.
   d. Columns, carrying, gaps, zeros, sums to 39 and 9.
   e. Dollars and cents.
   f. Related facts for carrying in multiplication.
4. *Subtraction.*
   a. Review fundamental facts daily (5 minutes.
   b. Related facts.
   c. One-step adjusting.
   d. One-step adjusting, occasional vanishing left and other difficulties.
   e. Double adjusting.
   f. Double adjusting with figure 9 in the subtrahend.

[7] Wilson, G. M., "New Standards in Arithmetic." *Journal of Educational Research,* 22:351-360. (December, 1930).
[8] All of these plans are based upon the Wilson *100% Drill Book in the Fundamentals,* Macmillan Company, New York. There is slight adaptation in Grade II, made necessary by beginning drill in this grade instead of deferring it to Grade III, as recommended in the Drill Book.

5. *Multiplication.*
   a. 100 primary facts.
   b. One-place multiplier, carrying requiring addition in same decade.
   c. One-place multiplier, no carrying.
   d. One-place multiplier, carrying required addition to higher place.
   e. One-place multiplier, zero in the multiplicand, with and without carrying to the zero.
   f. Two- and three-place multiplier, no carrying.
   g. Two- or three-place multiplier, with carrying.
   h. Single zero in the multiplier.
   i. Double zeros in the multiplicand and the multiplier.

GRADE IV

A. Review daily the fundamental facts, in addition, subtraction, and multiplication.

B. Short division.
   1. All phases as per the Wilson Drill Book.

C. Long division.
   1. All phases as per the Wilson Drill Book.

Fortunately this placement of drill does not entail additional work for the instructor. On the contrary, it relieves the teacher of much work in preparation for classes, and progress of the children can be observed by the real understanding of the process and the quality of the work done by the individual and also by the class. It is possible to teach pupils the fundamental facts in addition and subtraction in Grade II. Neglect to teach 100% in the fundamentals in grades II and III in the past had caused the children in Grade IV to be over-burdened and to hate arithmetic. With the 100% ideal and each grade doing its work on the 100% basis, we find practically all children enjoying and liking arithmetic. It would be better to defer systematic drill to Grade III, to move multiplication to Grade IV, and to place long division in Grade V. This we hope to bring about, but at present our course of study and follow-up tests require the grade placement as given above.

The 100% ideal of the later grades can be met successfully only if the preliminary elements have been understood perfectly and if the necessary skills have become thoroughly automatic.

Amount and distribution of drill varies with the difficulty of the combination. Combinations should be presented in direct and reverse fashion—as $5 + 8$ and $8 + 5$, as they may be very unequal in difficulty. Both forms should be taught and enough time must be spent on the combination to secure permanent retention.

Individual differences should be noted and learning opportunities should be adjusted to meet them. Exceptional children, when their interest in obtaining 100% is aroused, will advance rapidly.

Drill work should not be carried on in the spirit of drudgery, with the mechanical matter-of-fact repetitions. It should be motivated, have a legitimate appeal to the spirit of competition, and have a life appeal. Many games and play devices should be helpful to the child in obtaining the 100% ideal and prevent the forgetting of what has previously been learned.

Pupils who have the idea that work is worthless unless it is correct and accurate form the habit of accuracy and avoid errors.

Carefully adapted tests should be used occasionally to find out what progress the class is making. They will also reveal the weaknesses of individuals and of the class. The efficient teacher will analyze the weaknesses of pupils, segregate her pupils into groups according to their needs, and skillfully plan her work to fit the differences in the abilities of the groups. The teacher should stimulate the pupils to excel their previous best record and prevent initial discouragement through easy mastery, by a leisurely, step-by-step unfolding of the fun-

damentals. No test should contain anything that has not been taught thoroughly.

Pupils' interests are increased if they keep a record of their errors or a graph of individual progress, so that they may compare it with the class progress. Each pupil knows where he stands in relation to the other members of the class and what facts he needs more practice in, and he feels a responsibility for his own improvement.

Children should be taught to check all of their results as it is a very important factor in securing accuracy. They should use the most efficient methods in proving their results.

When knowledge of the process and 100% accuracy of computation is assured, time drills should be given to develop speed. Place emphasis on accuracy first; speed should follow.

Teaching procedures are many and varied so as to keep the children thoroughly interested and to furnish each child with the opportunity for habit and skill building aimed at ready automatic responses and the 100% ideal.

Accuracy must be stressed (and fought for) in order to bring out the habits of work and of thinking which will eliminate errors so ruinous to any form of calculation. Accuracy or the 100% ideal will not come with mere drill and practice. The pupil must be conscious of his weaknesses and must correctly drill until the response becomes automatic. Prevent error and remedial work will not be necessary. Good teaching requires that the teacher know the habits of work of each pupil; she must learn to detect counting or guessing; she must call for frequent oral reciting by any doubtful pupil; in short, she must learn how to teach.

Arithmetic as taught in the past sent many children into educational oblivion, but today, the children in arithmetic have developed a consciousness of progress and the achievement of 100% in the fundamentals brings to them joy and satisfaction.

STANDARDIZED TESTS IN ARITHMETIC

LOUISE BEATTIE

Henry Lord Junior High School, Fall River, Massachusetts

The need for adequate ways and means of testing instruction in arithmetic has been felt for many years. Tests in arithmetic should be given mainly for the pupose of securing information which can be used in making teaching more effective. The teacher needs detailed information in order to diagnose the needs of her pupils and to adjust her instruction to fit their particular needs. Properly constructed tests help in locating individual or class difficulties.

Tests in arithmetic may be divided into two classes: (1) tests in abstract numbers; (2) tests in written numbers. The tests in abstract numbers divide themselves into (a) the survey type, which consists of a sampling of the useful facts and processes; (b) the inventory test, which should be a complete inventory of the useful facts and processes. The purpose of a survey test is to secure a general measure of the level of achievement of the class or school. An inventory test is

TABLE I

Number of Fundamental Facts Used in the Fundamental Processes in Typical Inventory Tests

	100 Primary Addition Facts	300 Decade Addition Facts to 39+9	80 Addition Facts for Carrying in Multiplication	100 Subtraction Facts	100 Multiplication Facts	Short Division Facts
Buswell–John Diagnostic Charts	69	49	7	63	76	51
Compass Diagnostic Tests—1925	75	81	2	58	77	49
Monroe Diagnostic Tests—Part 1	75	103	0	21	90	49
Part 2	25	84	41	54	64	0
Wilson Inventory and Diagnostic Tests (older form)	100	298	79	100	100	447
Wisconsin Inventory Tests	100	227	79	98	100	126

The data of Table I show that the numbers of addition facts covered range from 25 to 100; the higher decade addition facts range from 49 to 298; the addition facts for carrying in multiplication range from 2 to 79; the subtraction facts from 21 to 100; the multiplication facts from 64 to 100; and the short division facts from 49 to 447.

TABLE II

Number of Fundamental Facts Used in the Fundamental Processes in Typical Survey Tests

	100 Primary Addition Facts	300 Decade Addition Facts to 39+9	80 Addition Facts for Carrying in Multiplication	100 Primary Subtraction Facts	100 Multiplication Facts to 9x9	Short Division Facts
Cleveland Survey Tests:						
Form 1	88	153	53	79	85	91
Form 2	89	162	55	70	81	94
Compass Survey Tests 1927						
Elementary Examination:						
Form A	58	20	4	54	100	42
Form B	50	26	3	54	100	46
Advanced Examination:						
Form A	40	28	0	26	37	7
Form B	38	31	0	24	42	10
Monroe Standardized General Survey Arithmetic Scales:						
Scale 1—Form 1	80	54	0	68	84	90
Scale 1—Form 2	76	54	0	60	81	92
Scale 1—Form 3	75	61	0	60	81	89
Scale 2—Form 1	63	96	0	54	71	.....
Scale 2—Form 2	56	98	0	51	66	.....
Scale 2—Form 3	61	95	0	44	66	.....
Pittsburgh Arithmetic Scales:						
Form A	28	66	9	29	34	13
Form B	30	42	5	28	46	9
Form C	29	62	9	33	34	15

The data of Table II show that the numbers of addition facts range from 28 to 89; the higher decade addition facts from 20 to 162; the addition facts for carrying in multiplication from 0 to 55; the subtraction facts from 24 to 79; the multiplication facts from 34 to 100; the short division facts from 7 to 94.

designed to point out the particular weaknesses of individual pupils. It is in giving such detailed information that the inventory test is of value. Much less attention has been devoted to the construction of tests in written numbers.

In choosing a test in arithmetic, care should be taken that the test be in harmony with and reinforce the right curricular principles; and that it reinforces the proper method of teaching. The extent to which standardized tests go beyond common adult usage is not considered in the present article.

Instruction and practice in the fundamentals of arithmetic are based on the full analysis of the fundamental processes. The most helpful test is the test that gives the most complete inventory of facts, primary and related in the fundamental processes, thus enabling the teacher to make a careful analysis of the pupil's work and on that basis plan remedial help.

TEACHING DENOMINATE NUMBERS AND MEASURES

DOROTHY W. WILSON

Graduate Student, Boston University

In a teaching program, the first question is what to teach. Recent research has shown that the teaching of denominate numbers and measures, as generally carried on, is time wasted. Obviously, the reason is that things are taught which are not needed in life and, therefore, the teaching makes no difference. This will bear a little careful examination.

Louth [1] and Sala [2] found that even such firms as the Universal Winding Company of Providence, Rhode Island, and the P. & F. Corbin Company of New Britain, Connecticut, each employing more than a thousand workers, had little use for the processes of denominate numbers taught in the schools. These researches agree that workers in industry, aside from those in the cost accounting and engineering departments, have no use for tables or reductions, and, for the most part, no use whatever for measurement. Louth, studying four manufacturing firms in Providence, employing a total of 2,661 workers, found only 287, or 11%, of the workers who had what might be called expert knowledge of units of measure and who used this knowledge in their work. On the other hand, 2,049, or 77%, of the workers had no use whatever for measures or units of measure.

In Sala's study, there were a total of 2,776 workers. Of these, 677, or 24%, were expert users of units of measure. The high percentage here is explained by the fact that in one of the companies which Sala studied, the Fafnir Ball Bearing Company, 70% of the workers were experts in the use of units of measure. Notwithstanding the presence of this highly specialized company in the list, when the figures for the four companies were combined, it was found that 1,998 out of the 2,776 workers had no use for measures. This is 71½% of the total.

In the Vulcan Iron Works of New Britain, Connecticut, 85% of the employees had no use for measures in any way, no use for tables, no use for reductions, nor for addition, subtraction, multiplication, and division of compound numbers.

Obviously, children have much less use for measures than men and women employed in highly specialized industries. Apparently, therefore, if we do any teaching of denominate numbers and measures in the schools, it will have to be something different from what we have been doing in the past.

A study [3] completed last year provides further evidence that in the past the schools have dealt largely with non-functional material in the field of denominate numbers and measures. This study indicates, first, that experience and use are the factors that determine the measures or units of measure that are known by children and adults; and, second, that the teaching of denominate

[1] Louth, Mary deSales, "Units of Measurement in Industry." Master's Thesis, Boston University, 1931.
[2] Sala, Vincent, "Denominate Numbers Used in Four Factories of New Britain, Connecticut." Master's Thesis, Boston University, 1931.
[3] Wilson, Dorothy W., "What Measures Do People Know and Why?" Master's Thesis, Boston University, 1936.

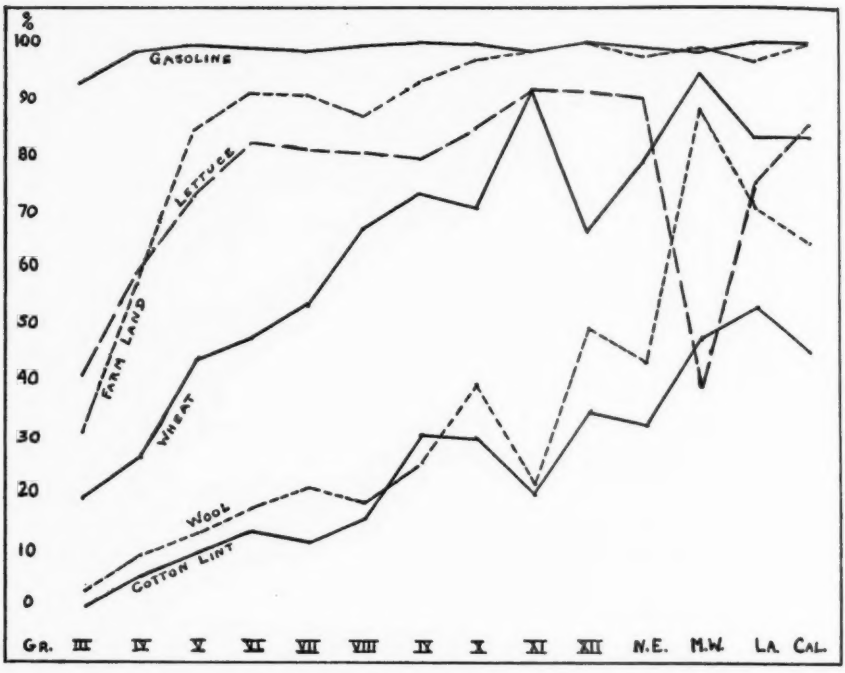


FIGURE 1. Showing comparative knowledge of various units of measure by children of Grades III-XII and by adults of New England, Middle West, Louisiana, and California.

numbers and measures in the schools has small effect upon later knowledge unless experience and use have come to the rescue.

Since conclusions are going to be urged on the basis of this study, the reader is entitled to know a little more about it. The study developed a plan of checking on the common knowledge of measures of both children and adults. Children were used from Grade III through Grade XII—a total of 1,097 elementary school children, 647 junior high school children, and 314 senior high school children. The adults consisted of 310 from New England, 332 from the Middle West, 77 from the South, and 42 from the Pacific Coast.

Three types of data were gathered from these 2,819 children and adults. They were asked, first, to indicate the unit of measure in which articles were sold in retail trade. The items included, among others, gasoline, farm land, milk, potatoes, dress goods, meat, wheat, cotton lint, bread, nails, and wool. Twenty items were used in this section. The story of correct answers is indicated graphically for six items, namely: gasoline, lettuce, farm land, wheat, wool, and cotton lint (Fig. I).

A study of this graph shows that the first item, gasoline, is such a common experience that, from the fourth grade on, practically all children and adults know the unit of sale.

The unit of sale for farm land is not commonly known by third grade children. However, 85% of fifth grade children know that farm land is sold by the acre, and at adult level this knowledge is fairly common.

The study of the curve for lettuce is interesting, particularly the drop to less than 40% correct answers of Middle West adults. The reason seems to be that, whereas sixth grade children in cities and larger towns in New England know that lettuce is sold by the head, because it is bought in the markets that way, and whereas this knowledge in general increases with maturity, yet in the Middle West most lettuce comes out of the garden and therefore is not bought at the store by the head. Lacking the experience, they do not have the knowledge.

On the other hand, the unit of measure for the sale of wheat is known by 95% of Middle West adults and by only 79% of New England adults. In general, the children in the metropolitan areas of New England have small knowledge of the unit of measure for the sale of wheat until they advance considerably toward maturity.

The story of the units of measure for wool and cotton lint is very interesting. The percentage of children in the grades and high school having this knowledge in the metropolitan areas of New England remains very low, notwithstanding the fact that Boston is the wool center of America. Obviously, however, this knowledge doesn't reach the home and the children in the homes to any large extent. Only a little over 40% of the adults in New England know the unit of measure for wool. This means that not a great many of them come in contact with it in a practical way. The wool merchants are relatively few. Their knowledge is not common knowledge. On the other hand, nearly 90% of adults in the Middle West know the unit of measure for wool. This obviously is because sheep are raised fairly commonly on the farms of Indiana and Iowa. Many of the teachers come from these farms or from villages in close proximity to farms.

The curve showing the percentage of correct answers for the unit of measure for cotton lint follows very closely the curve for wool up through the grades and high school. It might be expected that answers from adults in Louisiana would show a greater increase in percentage of accuracy for cotton than is indicated on the curve. The explanation may be that the group of students at the University of Louisiana who answered did not come from the distinctly cotton sections of the South. It is probable that many of them came from the city of New Orleans, from the Piney Woods section of Mississippi, and from other sections not distinctly cotton-growing. However, there is a slight increase in favor of the adults from the University of Louisiana.

Studying in a similar way the twenty items in this first section, the conclusion is unavoidable that the knowledge of units of measure comes through experience. The fact that meat is sold by the pound is almost as well known as the fact that gasoline is sold by the gallon. On the other hand, few know how nails are sold. However, if the child answering has a father who is a carpenter or a keeper of a small hardware store, he is likely to have this information.

Application of Measures

The second section of the writer's study sought to check children and adults on the application of measures, particularly long measure in simple situations. Under this scheme, the groups were checked on such items as the height of a dining-room table, the width of a full-sized bed, and the distance between the rails of a railroad track. A dining-room table is 30 inches high. It was not expected that many would know the exact height; what was looked for in this case was a fair answer. For the height of a dining-room table, a fair answer was arbitrarily determined as running from 28 to 34 inches. On this basis, the percentage of fair estimates on the height of a dining-room table ran from 3% in Grade III, 10%

in Grade VII, 13% in Grade XII, on up to 18% of adults in New England and 31% of adults in the Middle West. The average for adults was 24%.

The width of a full-size bed is 54 inches. A fair estimate was arbitrarily decided as running from 50 to 58 inches. The percentage of fair estimates was: 1% in Grade III, 4½% in Grade VII, 17% in Grade XII, 11% among the adults of New England, and 28% among adults in the Middle West. The average for the adults was 18.8%.

The percentage of fair estimates for the distance between the rails of a railroad track ran very close to that of the height of a dining-room table. Three per cent of third grade children gave fair estimates, 12% of Grade VII, 13½% of Grade XII, and 27.6% of adults. Here, again, the Middle West adults with 32.8% of fair estimates gave a better account of themselves than New England adults with 23.3%. This difference between the Middle West and New England groups appears to be explained by the fact that more of the Middle West groups came from farms and they evidently had a larger experience in measuring and estimating in connection with the farm and the home. This conclusion was checked in a small way in New England by using a rural group against a city group with the same general results in favor of the rural group.

The third line of study by the writer involved checking specific knowledge of certain measures, such as the number of inches in a foot, the number of ounces in a pound, the number of acres in a quarter section, the number of pounds in a bale of cotton, the number of dozens of eggs in a crate, the number of pounds in a bushel of wheat, the cubic inches in a cubic foot, and other items. In this part of the study, it was interesting to note that simple measures, such as the number of inches in a foot, tended to be known almost perfectly by the sixth grade pupils and continued thereafter at near the 100% level.

On the other hand, right answers to such an item as the number of acres in a quarter section scored close to zero throughout the grades and high school of the metropolitan areas in New England. The percentage of correct answers by adults on this item is quite revealing. New England adults, which means New England teachers attending Boston University, in general do not know the answer. Only 10% answered correctly. On the other hand, of the Middle West group, 69% answered correctly. In California, 59% answered correctly; in Louisiana, 25%. Those familiar with the facts will understand that the quarter section is not in common usage in New England. The government survey was never made in New England. On the other hand, Iowa, Indiana, and California were completely covered by the Government survey. Knowledge of the quarter section is common in all rural sections where this survey was made, and is fairly common among adults even in towns and cities.

The answers as to the number of pounds in a bale of cotton show that the Louisiana adult group has more accurate knowledge on this item than any other adult group: 62% of the Louisiana group answered correctly, 10% of the New England group, 36% of Middle West group, and 24% of California group.

On the item which calls for the number of dozens of eggs in a crate, the correct answer is 30. Very few people know this, unless they have had experience in packing eggs or in ordering eggs in quantities. The outstanding group in this case is Middle West adults again, 26.5% of whom answered correctly.

The answers to the number of cubic inches in a cubic foot are interesting inasmuch as this fact is generally taught in the schools. The correct answers average 0% in Grade

III; 6% in Grade V; 19% in Grade VII; 27% in Grade IX; and 15% in Grade XII. Among adults, the average percentage of correct answers was only 54, although this item is taught almost universally in the schools. The explanation of the large amount of forgetting is that the fact is not used. The fairly good showing of adults is due to the fact that the persons used in this study were teachers.

These data and many more to the same effect furnish the basis for the conclusions noted before, that experience determines what one knows about units of measure and that teaching in the schools does not have much effect unless reinforced by experience.

What then can the schools do about it? Evidently, the only thing to do is to extend the experience of the child. Adults do not go about using measures promiscuously; they use them only when the need arises. They buy and sell in units, they occasionally measure something, or estimate in units. If our teaching were to follow a similar plan, it would mean that the child would be led into a knowledge of commodities and then, in a similar way, the units would be applied to those commodities. However, the teacher should not get the wrong impression on this point. There is apparently no advantage in going beyond experience, there is no point in teaching the average northern child the number of pounds in a bale of cotton. He will forget it promptly, and is not to be blamed for so doing. On the other hand, children who live with cotton, plant it, cultivate it, pick it, ride the load of seed cotton to the gin, and ride back again with a bale of cotton, have the experience basis for this knowledge, and so it clings to them without any effort on their part.

The other thing which the schools may do is to lead the child to develop clear, objective concepts of simple measuring units. The child should be able to estimate the length and width of a room; he should be able to pace with a high degree of accuracy a given distance. The viewpoint here is more or less that of the boy scout, learning to do in a practical way. The schools should direct the child in doing things that are useful.

Beyond the development of experience and the building of clear concepts for practical usage, there is apparently nothing to do. The committing of tables is unprofitable. Reductions are unprofitable. The teaching of addition, subtraction, multiplication, and division of compound numbers should be omitted from course requirements and from all tests.

This simpler program will be a matter of very great relief to the child. Many textbooks develop, through hundreds of pages, manipulation in the measures and denominate numbers. This is meaningless to the child at the time; it is promptly forgotten. The time so spent has been wasted or, at least, very unprofitably employed.

CORRECTIVE ARITHMETIC IN JUNIOR HIGH SCHOOL[1]

JOSEPH H. RANDALL

Angier School, Newton, Massachusetts

The purpose of this article is to present briefly an experimental study in corrective arithmetic at the junior high school level, and to point out possible means of reducing the rapidly increasing criticism of arithmetic for its failure to meet its educational responsibilities. That arithmetic, as generally presented in the public schools, is failing to meet even the requirements of a tool subject has been made quite evident by research of the past twenty years. Yet in the face of incontrovertible objective evidence condemning them, traditional methods continue to be used and traditional material continues to choke the textbooks.

The point of view taken by the writer is that of a small but ever-increasing number of teachers, that one hundred per cent accuracy and adequate speed in the fundamentals of arithmetic may easily be attained by pupils of average intelligence if the non-essentials of the subject are eliminated and if the parts which are essential for business and social usage are taught by the proper techniques. The drill technique should be confined to those elements in which common business and social usage require automatic response. The results of significant research and not mere opinion should determine the content of the arithmetic program.

Although, in bringing about a universal acceptance of these ideas, we must face the same inertia or reluctance to change which has always governed educational progress, we may find limitless opportunity for worthwhile effort in the field of corrective arithmetic. The value of demonstrations in the corrective field lies in the fact that the pupils selected are already failures of the traditional program and their salvage therefore gives more pointed emphasis to the utility of the progressive view.

In the experiment with which we are here concerned, a small group of eighth grade pupils, above the average in intelligence, who had shown considerable weakness in arithmetic, were given remedial work in addition, under the limitations and by means of the drill technique proposed by Wilson.[2] The specific purpose of the experiment was to see how long it would take these pupils to overcome their difficulties with addition, sufficiently to attain one hundred per cent in reasonable time on the Wilson 3P-Addition Test. The same test was used as a preliminary test in the selection of the pupils for the corrective group.

In the process of selection two hundred eighth grade pupils in the North Junior High School, Quincy, Massachusetts, were given the 3P-Addition Test. Eighty-four of these gave evidence of weakness in the fundamentals of addition, either by unsatisfactory scores, by unreasonable time, or both. Forty-nine of these, whose intelligence quo-

[1] An abstract of a Master's Thesis written by the author of this article at the School of Education, Boston University, 1936.

[2] Wilson, Guy M., *100% Arithmetic, Teachers Manual.* The Macmillan Company, 1933.

tients were shown on their office records to be over one hundred, were selected for further testing. They were given first a test covering the one hundred primary facts of addition and next a test covering the three hundred upper decade facts through $39 + 9$. On the basis of the results of these tests eleven pupils were chosen, all of whom it was felt showed extreme need for remedial work in addition. Nine of these expressed enough interest in the proposed program to be willing to devote the extra time necessary for the work. One of the nine, however, was obliged to leave school because of illness, so that eight pupils finally undertook and completed the remedial program.

The corrective procedure consisted of general and individualized drill, properly motivated, and directed by frequent diagnostic testing. For general drill each pupil was required to complete the work in Wilson's *My Addition Drill Book*.[3] Five diagnostic tests were designed to cover thoroughly the factual field, and the results obtained by each pupil on each test were carefully analyzed and used in the preparation of individualized drill assignments for each pupil. Some of these assignments were written and some were oral. For oral drill frequent use was made of small flash cards, each card bearing a single addition fact which had proved troublesome. In using the cards, pupils were paired off and drilled each other. A typed report of every error made on each diagnostic test was prepared for each pupil and given to him at the class meeting following that of the test. On these reports the analysis of each error included suggestions for its future avoidance. A careful record was kept of the time spent in drill work inside and outside the classroom. The final test was given to each pupil when he had finished the drill book and his individual assignments.

Table I shows initial and final scores and time for each of the eight pupils on the 3-P-Addition Test. Key numbers are used in place of the names of the pupils.

Table II segregates the time in minutes spent by each of eight pupils in various phases of the work and also indicates the total time spent by each pupil in the corrective program.

Typical Individual Results

Pupil C8 attained a perfect score on his final test to compare with an initial score of 80. In checking, he discovered four errors and corrected them. This pupil took one and one-half minutes longer on his final test than on his initial test, without considering his checking time of five minutes on the final test. There are two reasons for this. The writer's constant emphasis, throughout the corrective period, on the point of accuracy being more important than speed, evidently carried over into the final testing. There was a noticeable tendency on the part of C8 to work more deliberately. Moreover, C8 had not cured himself of the counting habit when the final test was given. For this reason his time was greater than that of any other pupil. During the corrective period this pupil raised his report mark in general mathematics from a "D" to a "B." He expressed great appreciation for what the corrective class had done for him.

Pupil D22 attained a perfect score on the final test to compare with an initial score of 92. No errors were discovered in the checking. It is justifiable to credit her with a gain in time of three minutes. If this pupil had been able to cure herself completely of the habit of skipping about in column addition, with consequent retracing of work, she would have made a greater gain in time. During the corrective period this pupil raised her report mark in general mathematics from a "C" to a "B."

Pupil F13 attained a perfect score on the

[3] Wilson, Guy M., *My Addition Drill Book*. The Macmillan Company, 1933.

PROPERTY OF
GRAND RAPIDS PUBLIC SCHOOLS

TABLE I

COMPARISON OF SCORES AND TIME BEFORE AND AFTER CORRECTIVE WORK

Pupil	Initial Score	Initial Time	Checking Time	Final Score	Final Time	Checking Time
C8	80	11–1/2	.....	100	12–1/2	5
C24	76	10	.....	100	7	8–1/2
D22	92	13	.....	100	10	2–1/2
F4	92	8	.....	100	7	6–1/2
F13	76	10–1/2	.....	100	8	.....
F14	100	13	.....	100	7–1/2	3
H1	76	.....	.....	100	6–1/2	2
P1	72	7–1/2	.....	100	8	8

REMARKS: The Wilson 3P-Addition Test was used for both the initial and the final test. Time in the table is given in minutes. H1 recorded her initial time as two minutes, which was obviously incorrect. Accordingly it is not recorded.

TABLE II

TIME RECORDS

Pupil	Intelligence Quotient	Drill Book	Class Work	Time on Tests	Total Time
C8	108	294	606	175	1075
C24	106	260	615	76	951
D22	112	343	334	155	832
F4	135	338	475	111	924
F13	114	333	389	136	858
F14	119	189	653	144	986
H1	101	201	490	93	784
P1	126	197	391	77	665
				Mean total	884

REMARKS: Time is given in minutes.

final test to compare with an initial score of 76. He made a gain in time of two and one-half minutes. Whether or not he checked his work is not known, as he did not keep his checking time separately.

Pupil P1 attained a perfect score on the final test to compare with an initial score of 72. In checking, two errors were discovered and corrected. She spent one-half minute longer on the final test than on the initial test and did not hurry in the checking. The record of this pupil is rather remarkable in view of the fact that she spent less time in the corrective class than any other pupil. Due to a conflict of schedule, she was obliged to miss one meeting each week. In

spite of this, she made a significant gain in accuracy.

Conclusions

It seems to the writer of this article that, while the scope of the experiment was not wide enough to be statistically significant, several inferences having a greater force than mere opinion may be drawn from the results. Therefore, the following conclusions are listed.

1. It is possible, with pupils of higher than average intelligence, at the junior high school level, to correct faults in factual knowledge and process skills of addition of whole numbers and decimals, with a reasonable expenditure of time in properly motivated individual remedial work. For proof, we submit the fact that it was done in several cases in the present study. These pupils had been given, from Grade II to the middle of Grade VIII, approximately 46,800 minutes of classroom work in arithmetic, and they exhibited significant weaknesses in the fundamental facts and skills of addition as shown by a series of inventory tests. After an average expenditure of time of 884 minutes (see Table II) in a program of remedial work based on the "100% plan," they showed significant improvement and secured perfect scores on the final test in addition. Since 884 minutes is less than two per cent of 46,800 minutes, and in view of the results secured, it would appear that the time required for the remedial work might justifiably be termed reasonable.
2. Process difficulties are much harder to overcome than are weaknesses in factual knowledge, due to the force of habit, which at the junior high school level has had up to seven years in which to strengthen.
3. Pressure of speed seems to promote inaccuracy.
4. Remedial work in arithmetic, based on the limitations and conditions of the "100% plan," should be scheduled as an elective in all curricula of junior high schools, and pupils of average or better than average intelligence, who indicate weakness in arithmetic fundamentals, should be encouraged through guidance to take this work. (The wording of this conclusion conforms strictly to the limitations of the study. Doubtless all junior high school pupils who need it should have corrective work).
5. In order to lessen the corrective load in junior high school, and to insure that pupils who leave school at the minimum allowable age shall be equipped for a useful life, the arithmetic required of all pupils at any level should limit drill material to the essential facts and processes which, as research has already demonstrated, meet the demands of common business and social usage.

ELIMINATING THE TEXTBOOK PROBLEM

HELEN ALLPHIN

Supervisor of Grades IV-VI, Public Schools, Denver, Colorado

Sighs and sometimes suppressed groans have often met the assignment: "Work the first ten problems on page 63." And it would be hard to find the teacher who had not had a youngster, when confronted with a problem, look into her face and ask, "Do you divide?" If the teacher is able to keep a noncommittal expression, the queries proceed, "Do you multiply? "Do you add?" "Do you subtract?" Such reactions have led to the conclusion that, if possible, the textbook problem should be eliminated; and this in spite of the fact that textbook problems have shown a decided improvement in that they are now more often based on children's interests than formerly, they involve less reading difficulty, the number of processes involved has been decreased, and the sizes of the numbers used are smaller.

Pick up almost any modern course of study in arithmetic and there will be found a statement similar to this one from the Denver course of study: "The arithmetical needs of the child, whether immediate or future, occur in problem situations. To help the child meet these needs is the major aim in teaching arithmetic. Drill for mastery on particular processes and skills is justified only insofar as it contributes to the main purpose of teaching arithmetic."[1]

Granted that the only reason for teaching arithmetic is to meet the arithmetical needs of the child, then the child does not learn that five 9's are 45 so that he may ponder it in his leisure time or entertain himself as he walks to school by repeating the multiplication table.

But the textbook problem has seemed to fail of its mission. Problem solving has not flourished under its régime. The result has been an acceptance of poor performance on the part of teachers, and problem solving as a necessary evil on the part of children.

Let us, however, consider the case of nine-year-old Jack, who was permitted to entertain nine small friends at a birthday party. Mother restricted the expenditure of money to two dollars. What were his problems? Could he purchase for each of his nine guests a surprise package costing five cents, and still have enough money left for ice cream and cake?

Jack brought his problem to school, and his fourth grade classmates helped him to solve it. It was of vast importance that five 9's are 45, because $.45 was needed for the surprise packages. It was ascertained that, after spending $.45, $1.55 was left. The possibility of having cake and ice cream was next considered. No one knew the cost of a cake which would serve ten children. Therefore, the class visited a bakery and found that $.75 would pay for the cake. The next step, of course, was to see how much would be left from the $1.55. Then, would $.80 buy enough ice cream? This time a trip to the neighborhood creamery furnished the information that ice cream was $.50 a quart and that a quart and a half would be adequate for ten boys and girls.

[1] Course of Study Monograph Number 4, Arithmetic, Elementary School—Grades Three, Four, Five, and Six. Denver Public Schools, 1933.

Great was the excitement when the class decided that Jack could pay for his party and have five cents left.

Then there was Jane. She had been chosen to make and place the design on the cover of the fifth grade class book. After the design was made, Jane was not able to place the design to her own or the group's satisfaction. Finally she asked for help. After discussion, it developed that it was necessary to find the center of the design, which was three and seven-eighths inches across. A classmate exclaimed, "Why, that's just like the examples we're working in arithmetic—dividing a mixed number by a whole number." After the computation had been made and the design placed to everyone's satisfaction, Jane declared, "Well, that's one time arithmetic was of some use."

Recently a fourth grade group was asked, "How tall are fourth grade children?" No one knew. The children were a bit puzzled when, as they measured each other with yardsticks, they found that each child seemed to be a different height. As the work proceeded and was finished, these children were amazed to discover that, in their fourth grade room, children were of only three heights—the smallest about 48 inches tall, the midde-sized about 50 inches, and the tallest about 53 inches.

In a unit on water conservation, a sixth grade built, to scale, a model of the Hoover Dam. All measurements were taken from materials furnished by the United States Department of the Interior. This activity entailed the most careful work in comparison of distances. Morning after morning the children were waiting to meet the teacher and to continue carrying out their plans in figuring and measuring and finally making the molds into which the concrete was poured. It was a red-letter day when parents were present to hear about the difficulties which had been encountered and overcome, and to see that the Dam really did work. An engineer from the United States Bureau of Reclamation in Denver was also present. He carefully inspected the children's model, and, after complimenting them on their careful work, showed them one of the Department's models constructed on the same scale as their own. Several children were heard to exclaim, "Our model is almost as good as Uncle Sam's."

Children, in meeting their needs, as described in the foregoing activities, often solved problems of many more steps than most curriculum makers would advise for elementary school children. This was possible because the problems were solved in the situations in which they occurred. The desires and needs of the children demanded that the correct answer be obtained. The activity could not be satisfactorily completed in terms of child appreciations without the contribution which arithmetic could give. Most of the children were aware of this.

The average textbook problem is a thing apart—cold, pulseless. It presents no challenge. Textbook problems have become formalized because they are abstracted from the situations in which they were once vital. The spark is lacking to make the contact between the children and the problem. An impassable gulf seems to exist. That gulf can be spanned and the contact made when textbook problems are replaced by the problems which exist in life in or out of the classroom. Problems arising in the classroom present themselves to the child just as problems are presented to him and to his elders outside of the classroom. Textbook problems face one in cold type, and they lose the appealing quality of "Can I have a new cap?" or "Have I enough money to go to a show?"

Real life abounds in problems. Seeing eyes and listening ears are all that are needed. At least a partial desertion of the textbook problem is possible in every classroom.

EXPERIMENTING WITH REAL SITUATIONS IN THIRD GRADE ARITHMETIC

HENRY HARAP
Bureau of Educational Research, Ohio State University,

AND URSULA BARRETT
Milford School, Cleveland, Ohio

THE PROBLEM

Following four years of experimentation in Grades V and VI,[1] we undertook to discover whether the fundamentals could be learned in an arithmetic activity program for Grade III, in which integers are studied. We took special pains to select an average public school situation involving a normal class of 43 children taught by an average teacher. In the past, the experimental class was taught by a teacher of many years of successful experience. For our present purpose we selected a teacher who was a graduate of a two-year normal school; who had had no professional training since she had secured her diploma; and who would be classified in the middle group of the teaching staff. While she was reluctant to undertake the experiment in the beginning, she entered into it wholeheartedly when it got under way.

The intelligence quotient of the pupils on the National Intelligence Tests ranged from 67 to 123, the average being 100.6. Besides five periods of 40 minutes per week devoted to arithmetic, the weekly program included language, geography, history, music, art, shop, science, reading, and gymnasium. Our experiment was limited to the five arithmetic periods which came first on the daily program. In the present study we introduced two new elements: (1) to find out what success an average teacher would have with an activity program; and (2) to apply the program to a lower-intermediate grade level.

THE UNDERLYING THEORY

In the five years of experimentation, we have not set forth the theoretical justification for the procedure followed in the experimental program. So far as we have a theory, it is briefly this: Learning goes on most effectively when the child enjoys what he is doing, or when he is so strongly motivated by an alluring purpose as to be unaware of the monotony involved in the enterprise. When a child accepts an enterprise as his own, he works diligently and understandingly to bring it to a successful conclusion. In the daily life of the child, it is natural for him to express himself through all of the senses and to derive satisfaction from movement, manipulation, construction, play, inquiry, and companionship. He is particularly annoyed by neglect of these outlets of self-expression when it results from felt restraint.

Perhaps the greatest stimulus to learning is the child's degree of at-homeness in a situation. The individual seems disposed to

[1] The units in decimals and fractions may be obtained from Mr. Harap. They are issued in three mimeographed bulletins: No. 33, *Six Activity Units in Fractions,* 15 cents; No. 36, *Five Activity Units in Decimals,* 15 cents; No. 38, *Eight Activity Units in Decimals,* 20 cents. Add 5 cents for postage.

learn better when he begins with a setting that is familiar or, at least, understandable. Under these circumstances an experience has meaning and the child is mentally comfortable. At this point, his acceptance of the purpose is probably determined, and his attitude toward the activity is strongly felt. Soon he becomes aware of the goal and of every successive step toward its accomplishment. As the pupil progresses toward his goal, all the incidental facts and processes fit together neatly into a coherent experience.

An Outline of the Year's Work

The units which made up the work of the year were selected because they offered abundant opportunity for computation with integers. Each unit constituted a complete and meaningful experience in the school or home life of the pupil. The activities of the children were real and varied and included: shopping, cooking, baking, measuring, weighing, sewing, calculating costs, selling, collecting money, making change, spending money, making Christmas gifts, keeping accounts, and so on. In the early stages of experimentation the actual selection of the units was not left to the children, but they were taken up willingly by the children since they had interest value far in excess of the ordinary verbal learning that characterizes the formal school. With an experienced teacher there is nothing in the nature of our procedure which would prevent a liberal amount of pupil choosing. Much of the time ordinarily devoted to drill and problem solving was devoted to construction, manipulation, and other activities. The work of the year included ten units: Peach Butter Sale, The Community Fund Drive, A Puppet Show, Making Shampoo, Giving a Mothers' Party, Keeping Teacher's Lunchroom Accounts, Hand Cream Sale, Paper Sale, Taffy Pull, Mother's Day Gift.

New arithmetic steps were taken up as it became necessary to use them. No practice sheets, textbooks, or any other supplementary exercises were used. The repetition of the thirty-four steps in integers covered in Grade III was limited exclusively to their occurrence in the ten units which made up the work of the grade.

The Results

We kept a daily record of the order in which each step occurred and the number of times each step was repeated. The thirty-four basic steps were incorporated in the initial and final tests given to the pupils. In addition, the class was given the Los Angeles Diagnostic Test in Fundamentals of Arithmetic. As measured by our test of fundamentals, the class attained a mastery of 93 per cent of the steps set up as the goal of the work of the grade. Twenty-four pupils mastered an average of four steps in excess of the requirement of the grade. On the Los Angeles Diagnostic Test, the class attained a final score of 4.1 in grade equivalents, indicating that the group was slightly in advance of the normal grade standing. These results confirm our earlier findings that the fundamentals can very satisfactorily be learned in a program of arithmetic units based on real situations in which arithmetic is learned as it is used—not before it is used. The final unit is given in detail to illustrate our procedure.

A TAFFY PULL PARTY

A Unit in Arithmetic for Grade III

(13 periods—45 minutes each)

The preparations for the Taffy Pull Party began formulating when the children found that they had enough money on hand to entertain another third grade group. An entertainment committee was chosen and accepted the responsibility of selecting games that would have been enjoyed by the children in early Cleveland.

The children planned to serve each guest and host one popcorn ball and a liberal amount of

taffy syrup. Numerous recipes were submitted to the class for selection. The following popcorn ball recipe was chosen:

Popcorn, 5 qts.	Water, 1½ cups
Sugar, 2 cups	Salt, ½ teaspoon
Karo Syrup, ½ cup	Vanilla, 1 tablespoon
Butter, ½ teaspoon	Vinegar, ½ teaspoon

Combine syrup, sugar, water, vinegar, and salt. Boil till it forms a hard ball (in water). Add vanilla and butter, pour on popped corn. Stir till coated, rub hands with butter (to prevent sticking), press closely and form into balls.

Shopping for the above ingredients began immediately. A boy was chosen to buy popcorn:

$.50 money given clerk for popcorn
.29 change received
$.21 : We paid $.21 for popcorn.

The children tried this popcorn but found it to be difficult to pop. They decided to return one package, therefore:

$.21 money spent for popcorn
.10 money refunded
$.11 : We spent $.11 for popcorn to date.

A shopper was then chosen to go to a Carmel Corn Shop, where popcorn could be bought fresh. The shopper reported the transaction:

$.35 money given to clerk
.31 cost of popcorn
$.04 : The shopper received $.04 change.

A "to date" report for popcorn was listed:

$.11
.31
Total $.42

Since the ingredients for the syrup had to be purchased, one of the boys asked to do the shopping and reported his purchases thus:

1 lb. white sugar	$.06
1 can blue label Karo syrup	.13
¼ lb. butter	.09
1 small bottle vanilla	.10
Total	$.38

$1.00 in money given to George
.38 " " spent by "
$ .62 : George brought back $.62 in change.

The children brought electric popcorn poppers from home. They were each given a turn popping at least a part of a batch. They tried popping two ounces in the popper but found that this crowded the popper, leaving many hard kernels unpopped. They tried one ounce and found this to be satisfactory. Groups of children were given an opportunity to weigh the popcorn while others turned the popper. After two periods of popping, they measured and found they had 5 quarts of popcorn. This was the amount specified in the recipe.

The next thing to consider was the making of the syrup. The ingredients were combined and placed on the electric stove. Two clocks were placed on the board. When the batch was completed, the clocks told this story:

BEGAN 11:06

REMOVED 12:05

(59 minutes)

The cost of the syrup for the trial batch was then figured:

1 lb. sugar	$.06
1/6 can syrup	.03
Other ingredients	.05
Total	$.14

This batch of syrup made 40 popcorn balls, which were enjoyed by the class. The children had estimated that they would have about 80 people at the party. The following shows the actual count:

39 children from room 204
41 " " " 201
5 adults
85 Total

Since the popcorn recipe makes 40 popcorn balls, it was necessary to increase the recipe.

$$\begin{array}{r} 2\ 5/40 \\ \hline 40/85 \\ 80 \\ \hline 5 \end{array}$$

We decided to make 2½ times as much popcorn and syrup as we did in the trial batch: ½ of 5 = 2½

$$\begin{array}{r} 5 \\ 2\frac{1}{2} \\ \hline 2\frac{1}{2} \\ \hline 10 \end{array} \qquad \begin{array}{r} 2\frac{1}{2} \\ \hline 2/5 \end{array}$$

12½ quarts, or 12 quarts and 1 pint needed.

Popcorn ball syrup expenses:

2½ lbs. of sugar	$.15
5/12 can Karo syrup	.07
Other ingredients	.13
Total	$.35

Next, we had to find a taffy recipe. The children selected a recipe and made a trial batch, but from the economic standpoint this did not prove to be satisfactory. It turned out to be quite sticky. One of the boys said it certainly wasn't successful, but the cobwebs formed on the fingers surely tasted good. Another recipe had to be selected. This time they hunted until they found one that had been recently tried in a home. The following recipe was tried and was very satisfactory:

Taffy Recipe

2 cups white sugar	1/3 cup water
½ cup white Karo	1 tablespoon vanilla

Combine sugar, syrup and water. Cook until it forms a hard ball when tried in water. Remove, add vanilla. When cool, pull until hard.

This recipe called for further shopping.

$.25 money given to Dick
.08 cost of the vinegar
$.17 : Dick received $.17 change.

$.22 money spent by Doris
.17 " given to "
$.05 : Doris owed the grocer $.05

$.50 money given to William
.11 " spent for glycerin
$.39 : William received $.39 change from the druggist.

Cost of ingredients to date:

$.42 for popcorn
.22 " Karo syrup and sugar
.11 " glycerin
.08 " vinegar
.38 " sugar, syrup, butter, vanilla
$1.21

During this period, the class was busily popping the corn and making syrup. A check-up at this time showed:

85 popcorn balls needed
65 " " made to date
20 : We must make 20 popcorn balls today

The successful taffy recipe gave 25 children a generous portion for pulling. Since 85 people were invited to the party, then:

$$\begin{array}{r} 3\ 10/25 \\ \hline 25/85 \\ 75 \\ \hline 10 \end{array}$$

We must increase the recipe 4 times.

The children planned on entertaining in their home room, which was not large enough. They found that 50 movable chairs would take care of the group and prevent crowding. This allowed one chair for the larger pupils and one chair for two of the smaller pupils. The adults were given regular desk chairs. Since this was not a formal party, they decided to use the desks as tables and allow one napkin to cover each desk; also, two small paper plates for the popcorn balls. Each package of napkins contained 80; therefore, we purchased 2 packages.

$$\begin{array}{r} 80 \\ 2 \\ \hline 160 \end{array}$$

We have 160 napkins.

50 napkins for desks
85 " —one for each guest and host
135 We will use 135 napkins

160 napkins bought
135 " used
25 We have 25 extra napkins

Two groups of shoppers completed the necessary shopping.

$1.00 given to Roy
.43 spent by Roy
$ .57 : Roy received $.57 change.

$1.00 given to William and Joe
.55 spent by William and Joe
$ .45 : They received $.45 change.

4 lbs. sugar	$.24
2 pkg. napkins	.20
¼ lb. butter	.09
	$.53
Tax	.02
Total	$.55

The day of the Taffy Pull was damp and dull, but not so the children's spirits. They spent the morning counting plates and napkins, and arranging the popcorn in bowls ready for serving. One of the boys wrapped a piece of butter and placed it on a plate on each desk, to be used for greasing the hands of two children before pulling the taffy.

The desks were arranged in a circle, with a table in the center. The stove was placed near by, so that the taffy might be cooking while games were being played.

The entertainment group had conferred with the teacher at an earlier date and decided to give a short description of the games to the children in the home room before the guests arrived, thus enabling the hosts and hostesses to be more familiar with the type of entertainment they were to provide. One of the boys was chosen as master of ceremonies and he performed his duties ably. After a short discussion as to the games to be played, the children continued their routine work.

The guests arrived at two o'clock, their hands spotless from recent washing. They eagerly awaited instructions in the art of pulling taffy. Games were played and popcorn balls eaten. Since there were a few extra popcorn balls, they were used as prizes in several of the games. Some of the games played were: French Blindman's Buff; Drop the Cane; Here's My Nose; Pin the Tail on the Donkey.

When the taffy formed a hard ball in water, it was removed from the stove and placed on cookie sheets to cool. The teacher from the visiting class served her group a portion of the cooled taffy. The home room teacher served her children. Some of the children were past masters in the art—others just pulled and pulled and ate the taffy.

The following day the class figured the total cost of the party, thus:

4 lbs. of white sugar @ $.06 per lb. =	$.24
1 lb. of Karo syrup @ .15 per can =	.10
Other ingredients	.07
Total	$.41

The total expenses for the taffy for the party were $.41.

Cost of the Taffy Pull

$.42 popcorn
.38 Karo, butter, vanilla, sugar
.08 vinegar
.22 Karo, sugar
$1.10

Brought Forward	$1.10
$.11 glycerin	
.55 sugar, napkins, butter	
.30 paper plates	
.43 popcorn	1.39
	$2.49

$2.81 money on hand
2.49 cost of the Taffy Pull
$ .32 : We have $.32 left of the money we allowed for the party.

DEVELOPING NUMBER CONCEPTS WITH YOUNG CHILDREN

LAURA HOOPER AND BARBARA STRATTON [1]

Public Schools, Newton, Massachusetts

Ideas, concepts, ways of thinking are the outgrowth of experience. Concepts of number are no exception to this rule. They do not develop in isolation from other types of experience. The child's ideas of size, space, time, shape, weight, enumeration grow gradually as he explores the world in which he lives. Before he reaches kindergarten age he may evidence considerable interest in number. Counting objects (one, two, one, two), placing beads or blocks in groups of two or three are often noted in the early play of children. At the age of two, when interest in language is at its peak, children will sometimes call numbers in order through eight, and even through twenty. This, however, is more often the result of coaching than of number thinking. According to the Binet-Simon Tests of Intelligence, not until the mental age of four can we expect a child to count a series of four objects, or until six, a series of thirteen objects. As experience answers the questions of when, how many, how long, how big, how much, for the child, he gradually learns to think with numbers and numbers become meaningful to him.

OPPORTUNITIES FOR THE DEVELOPMENT OF NUMBER CONCEPTS IN THE KINDERGARTEN

Before the child enters kindergarten, the normal activities of his everyday experiences have provided many opportunities for experience with number. He has counted, judged time, space, distance, has experienced "much," "some," "more," "less," "big," "little." Though his ideas regarding each of these is still limited, he has made a beginning, and it is upon these beginnings that the school must build if the course of the child's learning is to result in understanding rather than in confusion.

The kindergarten offers many opportunities for added understanding. In the kindergarten the child grows more conscious of the importance of time as the clock dictates the time for his daily happenings. "It is time to put your toys away," "It is time for lunch," "We have time for just one more story," are statements which he hears often during the course of the day. "We want more blocks, more paint, more napkins, more scissors," he frequently demands. As he shares in the many responsibilities of the room program, he learns to count people and objects. He counts the napkins, cups, crackers needed for lunch; he puts the crayons and scissors on the second shelf and blocks on the first shelf; he chooses two or three people to help him straighten the doll corner, two, three or four to play a game; he counts as he bounces his ball or jumps rope.

Group and individual interests call for measuring, buying, bartering, judging space, time, distance, amount, for counting, and for the use of number in various other ways. He may check off the days on the calendar

[1] Miss Hooper is Director of Elementary Education; Miss Stratton, a teacher in the primary grades.

as he waits for baby chicks to hatch, or for the arrival of a special holiday. He may come to recognize the numbers on the face of the clock as his attention is called to the appointed time for an excursion, for time to go home. He may learn to find the pages in a book as he and the teacher together explore the books on the library table for stories and for information. As he divides his playthings, or candy, or fruit with others he gains some knowledge of fractions. The child of five is learning rapidly. He wants to find out about things, and as he investigates his environment his conception of numbers grows. Before leaving kindergarten many five-year-olds can count twenty objects correctly; some of them can tell time, know the number of hands on a clock, legs on a horse, horns on a cow; know their house numbers, their ages, the number of people in the family. Many children recognize a penny, nickel, dime, have made purchases with each, and to some small extent have learned the value of each. In these and many other ways the kindergarten paves the way for further learnings in the primary grades.

The Continuation of the Learning Process in Grades I and II

A study of the child and his needs as he enters Grade I from the the kindergarten or from the home reveals, among other things, the fact that many important habits, attitudes, skills, and knowledges are already established. The learning process has gone on over a period of time, and it is not likely that it will stop when he crosses another threshold. He will continue to explore his environment and, as his horizon broadens and problems grow more complex, there will be an added need for arithmetic. *Teaching in Grades I and II will be effective to the extent that it takes him where he is and continues to help him find satisfying answers to his own questions and problems, and as it equips him with added skills and knowledge to meet new problems.*

The primary school of today provides an environment teeming with interest for every child. Books, games, boxes, work benches, tools, toys stimulate him to vital mental, social, and physical activity. The arrangement of the room is informal and inviting. In the course of the day's program there is time for him to pursue his own interests and to engage in a variety of group activities. The classroom belongs to him and his fellow classmen. It is a place where, under careful guidance, he is learning to adjust to his world. As he assumes his share of responsibility in caring for the room, watering plants, providing for and feeding pets, arranging materials, checking temperatures, banking, checking names for milk or orange juice, choosing activities and the appropriate time for activities, and running on errands, there is an increasing demand on him for using numbers. Accuracy in accounting, in judging time, space, distance, amounts, and skill in writing and reading numbers and in counting are developing; and there is a growing conception of the part which numbers play in everyday living. The rôle of the teacher is to see that the activities in which the child is engaged are of such a nature that he is growing in his ability to cope with his own problems. The games he initiates often call for scoring. Scoring may involve adding, subtracting, and multiplying, writing and reading numbers. The teacher will help him to see how important it is to be accurate, and she will supply games which will provide for additional practice. She will help him gain skill in the use of his own methods or show him new and better ways of scoring. By choosing those who are accurate as score keepers in class games or exercises, she will help children set higher and higher standards of accuracy for themselves. The following games have been used effectively in Grades

I and II as a means of motivating interest in numbers and of providing for practice in the fundamental processes of addition and subtraction.

Ring Toss, Dominoes, Bean Bag, Rainbow Fish Pond, Peter Rabbit, Peggity, Parcheesi, Five Black Cats, Tiddledy Winks, Jack Straws, Ten Pins, Lotto, Polly Anna (The Glad Game), Push-Me-Up, Winnie the Pooh, Tom Mix Circus Game.

Ten Pins (as used by teacher to provide for practice in counting and writing numbers and to develop accuracy in scoring).

X X X X
X X X
X X
X

A child is chosen to set up ten pins as indicated in diagram above. Players stand about four to six feet away from pins. As each player bowls he counts the number of ten pins knocked down and announces his score. A score keeper chosen by the teacher or by the class writes the score on the blackboard as it is announced. Each child in the room participates by writing the score on a sheet of paper. At the completion of the game the teacher, with the help of the children, may add and write the accumulative score for the entire group. As children write and add, the teacher checks their responses and gives help where needed.

As children in the primary grades continue to explore their environment, there are many evidences of their attempts to understand what they see and hear. Dramatizations of the storekeeper, policeman, street-car conductor, bus operator, ticket agent, and of family life are the outgrowth of excursions into the neighborhood. "The child's method of study is by impersonation, by putting himself inside the things he wants to know, being it and seeing how it feels. What the child imitates he is trying to understand." [2] In the modern schoolroom where there is an opportunity to reproduce what is seen and heard, the teacher can study the child's interpretation and help him to gain clearer impressions. He builds a store and an excursion to a neighborhood store helps him to decide how to build, what to sell, how to arrange his wares, what to charge, where to keep his cash, how to keep his accounts, where to get his goods, how to deliver them. As he plays the teacher makes use of his interest in motivating further learning. She shows him how to write numbers, how to add, to subtract, or to multiply if his play demands it. The building of the store, railway station, house, or train may call for measuring, buying, counting, judging space and size, and for evaluating. As he gains in skill in these and other processes, the game of playing store, house, policeman becomes more satisfying, and satisfaction in itself is motive for added practice and for further learning.

Cafeteria and Grocery Store Interest

How it started: One morning during our news period Herbert told us of his visit to a cafeteria. His story aroused much comment among our second graders as not many of them knew what a cafeteria was. Herbert's description was vivid. The teacher supplemented it so that a discussion arose and many questions were asked. The teacher then realized that here was a need for a real experience among these children. They all liked to eat in restaurants. Only three of these thirty-two children had ever eaten in a cafeteria. The following questions were asked:

1. What is a cafeteria like?
2. Why is it called a cafeteria?
3. Are there any waiters in a cafeteria?
4. What kind of food is served?
5. How do you know what to eat?
6. How much does the food cost?
7. Who cooks the food?
8. Where do you eat after you get your food?
9. Where do you pay your bill?

[2] Reed and Wright, *The Beginnings of the Social Sciences.* Charles Scribner's Sons, 1932.

These questions were answered tentatively by the three children who had visited a cafeteria and by the teacher. Finally, a suggestion was made that we make a play cafeteria in our room. This suggestion was welcomed and we started making plans.

Development: For the next three days groups of children were chosen to find stories about cafeterias in books from our library corner or in books found at home, and to find pictures. There seemed to be very few stories, and even fewer pictures. However, during that week the children had become so interested that four more children went to a cafeteria to eat, and so were able to give us many fine ideas.

We decided that to build the cafeteria the following materials would be needed: orange crates, hammers, nails, brown wrapping paper and two sticks of wood two feet long. These materials were gathered and the construction began. While groups of children were building the cafeteria counter, other groups were working on

1. Sign, "John Ward Cafeteria."
2. Models of food, using paper and clay.

Apples	Fruit Salad
Oranges	Chocolate Pudding
Bananas	Sandwiches
Soup	Tomato and Lettuce
Macaroni	Jam
Cookies	Peanut Butter
Cocoa	Chicken Salad
Milk	

(Note: These items had been decided upon by the children during our Health Lessons, in which we talked about what food made a good luncheon, breakfast, and supper. We decided that our cafeteria would serve only lunches.)

3. Price tags. (Note: It was suggested that the food prices would range from 1¢ to 10¢.)
4. Aprons and caps for waiters.
5. "Cashier" sign.
6. Napkins. (Note: We took paper napkins and drew designs in crayon on them.)
7. Checks.

To assemble all these things took about two weeks. The children had brought from home trays to put the food on, and one child had brought in a toy cash register.

Our final job was to decide on the correct price for each article of food. This was done by careful weighing of food values, and from the knowledge which our children had of food prices. For example, we knew that our bottle of milk each day in school cost 4 cents. It was then suggested that we price our milk in the cafeteria 4 cents.

In order that the free play in the cafeteria might be more satisfying and that all children might profit by the experience, the teacher often used the cafeteria as a teaching situation. At such times the following procedure was followed:

The cafeteria could hold five waiters to give out the food, one waiter to give out trays, one manager, two waiters to collect the trays after they had been used, one checker who punched the amount spent by the patron, and one cashier.

Different children were selected each day for these positions. They donned their caps and aprons, arranged the food on the cafeteria counter, and waited for their customers. Various children were selected to go to the cafeteria, choose their lunches, and return to their tables to eat them. Each child was given ten cents to spend in the cafeteria. As he went along selecting his food he mentally noted how much he spent. When he got to the checker, the checker would look over his tray and repeat the price of each article of food, such as: apple, five cents, milk, four cents, total nine cents.

The checker would punch on the check nine cents and give the check to the cashier, who would say, "Nine cents, please." The customer would hand him his dime. The cashier would then make change by saying, "Nine cents and one cent are ten

cents — one cent change." The customer would then take his change and return to his table to eat his lunch. After he had finished, a waiter would remove his tray.

It was gratifying to know that all during this experience every child in the room was participating in some way. When the children were not buying at the cafeteria they were writing down on their arithmetic papers the amounts spent by each customer. As the checker added up each child's tray aloud, a child stood at the board to write down what he said, such as

$$\begin{array}{r} 5¢ \\ 4¢ \\ \hline 9¢ \end{array}$$

The children in their seats would copy this. Sometimes, when a checker did not know a certain number combination, the children in their enthusiasm would help him.

Real money was used in this activity. The cashier was given at the beginning of each day a certain sum to be used for making change. It usually amounted to about 50¢ in pennies. He had to count out his money when it was given him. At the end of the lesson he had to count all the money he had received that day. The child at the board, with the aid of the teacher, also added up the amounts spent by all the customers at the cafeteria. (The teacher helped in this because the second grade was not supposed to use number combinations of over 10.) If the amounts added on the board checked with the actual amount of money which the cashier had, we knew that our figuring and counting had been done correctly.

As our cafeteria activity progressed, the children felt the need for another store in the room from which the cafeteria could buy the food that they were going to need each day. This was planned and built. It took the form of a grocery store. The children went about planning and building this in the same way that they had done with the cafeteria. Price tags were made, uniforms for the storekeepers were made, a telephone was installed, another cash register was procured, bills of sale were made, and we were ready to use our grocery store.

Outcomes, in terms of habits, skills, attitudes.

1. Knowledge of how cafeteria and grocery store look and are managed.
2. Knowledge of what constitutes a good luncheon.
3. Experience in making change and using real money.
4. Attitude of responsibility for money belonging to other people.

(Note: This activity was carried on for three months. During that time we had $1.50 which we used as our amount for cash, and no child who used this money failed to return even a penny of it. The money seemed to be regarded impersonally and for the use of everyone. This was most gratifying to the teacher.)

5. Knowledge of all number combinations up to 10.
6. Knowledge of sign: $, ¢, $.01.
7. Coöperation—sharing of materials and experiences.
8. Knowledge of relative prices of foods.
9. Practice in reading and writing numbers.
10. Courtesy—customer-waiter relationship. Experience in saying "please," "thank you."
11. Practice in using the telephone.
12. Ability to read all the signs around the cafeteria and grocery store.
13. Appreciation of how the storekeepers and cafeteria workers must coöperate in order to have their business run smoothly.
14. Skill in using scissors, crayons, paper, hammer, and nails.
15. Practice in making choices.

Needless to say, many dramatizations of this nature would call for a knowledge of processes beyond the ability of seven- and eight-year-old children. Column addition, addition and subtraction involving borrowing, and carrying may be needed and called for. This does not mean that the teacher will or should attempt to teach these processes. Children of this age should be

helped to get the answer and then be allowed to forget. The time will come when their background of experience will be such that they can understand and, therefore, will remember.

In grades I and II, if the environment is sufficiently rich and properly utilized, we may expect children to have experiences in buying and selling, estimating and measuring, planning trips, planning lunches, planning birthday and Christmas presents, playing games that call for numbers, using telephone numbers, number plates, weighing—in short, a wide variety of experiences that grow naturally out of living in a rich environment. There will be included some uses of counting, adding, subtracting, multiplying, and dividing; but these processes are to be regarded as incidental at this level; their mastery will come later.

Power in the use of number ideas and processes is a matter of time, experience, and individual ability. What is wanted at this level is meaningful experiences.

A STUDY OF THE ISOLATED PROBLEMS OF FOUR ARITHMETIC TEXT SERIES

GRACE E. JANES

Massachusetts Fields School, Quincy, Massachusetts

Do Mr. and Mrs. John Public or you and I stop our daily tasks intermittently to figure on examples like the problems which we had in school, in order to review and keep always before us those things which we were taught in arithmetic, those things which were given us but which we have had no call to use?

Many of the problems in arithmetic textbooks are merely put there to train our minds and for mental discipline. I refer to those problems which are twisted around just so we can exercise some phase of work which has been presented in class. Do you remember the problem which asked you to find the price of a cow, if ¾ of the cow cost $60.00? How many farmers buy cows like that in real life? When you see a barrel of apples, do you try to remember the number of cubic inches in that barrel, or do you say to yourself, "That's a good looking barrel of apples and the price is a fair one," or "I think I can get better apples at the next store"? When Mrs. Public buys a cotton shirt for Junior, does she stop to remember how many pounds of cotton there are in a bale, and what the day's market value of cotton is, or does she merely inspect the shirt carefully for weave, finish, and workmanship?

Think over your own experiences in life since you have left school. Think how little of difficult arithmetic you have had to do. If you are an accountant or a toolmaker, a private secretary or a housewife, you have trained yourself or have been trained on the job after leaving school to do that figuring which is needed in your special line of work. You have applied fundamental processes, for the most part, to well-understood situations.

It is the aim of progressive education to teach children what they need to know, what they use and will use in life after leaving school. Arithmetic textbooks, however, ask that children imagine themselves in

countless situations and then do appropriate figuring in those situations regardless of understanding. How unreal is the type of textbook problem which asks that a child find the cost of five pounds of butter at fifteen cents a pound! Wouldn't the more natural way for a child be for him to go to a grocery store to inquire the cost of a pound of butter today, and then find how much five pounds would cost him, if his family were large enough to warrant the buying of five pounds at a time?

How many different types of business experience calling for figuring does the ordinary adult need or use in a lifetime? I am told by a student who has done considerable checking on adult usage that he seldom encounters an adult who has figured in as many as 100 situations; in fact, that 50 different situations would cover the 90 percentile.

By contrast, textbooks ask the child to figure much more widely. Table I shows in column two the number of totally different situations covered in four different text series; while the last column shows decided variations in phases of the situations referred to in column two. For example, buying potatoes at the store and estimating the bushels of seed potatoes needed for planting would be counted as one situation in column 2, but as two phases in column 3.

The data in Tables I and II help one to understand why the isolated written problem of the textbook has little, if anything, to commend it, and why it is a chief source of confusion. Think of punishing the child through 500 to 1,000 pages of meaningless problems. They should be entirely replaced by something better. A recent study, confirming previous studies, indicates distinct gain through abandonment of textbook problems.[2]

TABLE I

SHOWING, FOR FOUR TEXT SERIES, THE TOTAL DIFFERENT SITUATIONS AND THE PHASES OF SITUATIONS OCCURRING IN WRITTEN PROBLEMS [1]

Text Series	Totally Different Situations	Total Phases of Situations
A	339	1,458
B	747	2,395
C	833	6,651
D	581	2,359

The text series referred to in Table I are given in Table II, but not in the same order.

TABLE II

LISTING THE TEXT SERIES REFERRED TO IN TABLE I

Text Series	Date	Volumes Analyzed
Child Life Woody, Breed, Overman.....	1936	3, 4, 5, 6
New Curriculum Brueckner, Anderson, Banting, Merton.....	1935	3, 4, 5, 6, 7, 8
Study Arithmetics Knight, Ruch, Studebaker, Findley.....	1935	3, 4, 5, 6
Modern School Arithmetic Clark, Otis, Hatton.....	1934	3, 4, 5, 6, 7

[1] Based upon studies by Julia Sheedy Wheaton, San Francisco, California; Marjorie Banton, Cleveland, Ohio; and Grace Janes, Quincy Mass.

[2] See Connor, William L., and Hawkins, Gertrude C., "What Materials Are Most Useful to Children in Learning to Solve Problems?" *Educational Method*, 16:21-29 (October, 1936).

PROPERTY OF
GRAND RAPIDS PUBLIC SCHOOLS

CHOOSING A TEXTBOOK IN ARITHMETIC

JANE BROOKS
Director, Mary Brooks School, Boston, Massachusetts
ASSISTED BY A. REBECCA PARSONS, R. W. T. BARCLAY, and CATHERINE SHEEHAN

The textbook used can be of much help to the child. On the other hand, it can crush and discourage him. This assumes that much of the teaching and general program is determined by the textbook—an assumption which should not prevail, but which does commonly prevail throughout the country.

It is doubtful if any other phase of our preparation for the teaching of arithmetic is more crudely handled than the selection of textbooks. In the olden days, the personality or salesmanship of the book agent largely determined adoptions. More recently, an arithmetic score card has been used.

Most score cards are too general to be of much value. They emphasize such items as: (1) problems based upon child interest; (2) teaching of process based upon step analysis; (3) attractive illustrations; (4) mechanical makeup and binding; and other similar points. Most of these items are in themselves very good but they are quite too general, and they are not adequately checked.

It is possible to analyze and check textbooks. Such checking by competent teachers and graduate students [1] has proved reliable. A second checking of the addition drill service of a textbook series showed a variation of less than 10 in a thousand, or less than 1%. For practical purposes this is accurate enough, and distinctly more reliable than the mere turning of pages, which frequently constitutes the only examination before adoption. There is at hand the results of such careful checking under direction of the process of addition as developed in five textbook series of fairly recent date.

These texts have been carefully checked by sections in such manner as to show the teaching steps and the facts used in each teaching step in the process of addition. The textbooks have been further checked on the addition used for proving subtraction, and in adding the partial products in multiplication.

The limits of this article will not permit spread of all of these data, but brief summaries of some of the essential items are indicated in Table I. This table indicates the text or drill service by letter, and does not reveal the letter for a specific text.

The studies summarized are based upon the analysis of the first volume of each of the texts indicated, involving the work of Grade III or Grades III and IV, the teaching grades for addition.

The basis of comparison is the 480 facts to be learned in addition, distributed as follows:

a. The 100 primary facts, beginning with 0 plus 0 and closing with 9 plus 9.
b. The 300 decade facts, beginning with 10 plus 0 and closing with 39 plus 9.

[1] Masters' theses, Boston University, School of Education, by the author and the three assisting authors of this article, 1926, 1929, and 1930.

c. The 80 higher decade facts required for carrying correctly in multiplication: 40 plus 1, 2, 3, 4, 5, 6, 7; —42 plus 1, 2, 3, 4, 5, 6; 45 plus 1, 2, 3, 4, 5, 6, 7, 8; —48 plus 1, 2, 3, 4, 5, 6, 7; —49 plus 1, 2, 3, 4, 5, 6; 54 plus 1, 2, 3, 4, 5, 6, 7, 8; —56 plus 1, 2, 3, 4, 5, 6, 7; —63 plus 1, 2, 3, 4, 5, 6, 7, 8; —64 plus 1, 2, 3, 4, 5, 6, 7; —72 plus 1, 2, 3, 4, 5, 6, 7, 8; —81 plus 1, 2, 3, 4, 5, 6, 7, 8.

An interpretation of the facts revealed in Table I follows: Of the 100 primary facts, four of the five texts taught the full group of 100 and used them. One text failed to teach six of the 100, but used the entire 100.

The situation with reference to the other two points of comparison is vastly different. Under "Decade Facts," of the 300 combinations required to be taught and used:

Text A taught only eight, but used 126 of the 300 (118 of them without any previous teaching) and omitted any reference to the remaining 174 facts.

Text B taught 0 facts, but used 197 without having taught them, and omitted the other 103.

Text C taught 18 of the 300, but used 264 without having taught them.

ever), and did not refer in any way to the remaining 36 facts.

Text D taught the full 300 facts and used the full 300 of them.

Text E taught only 8 of the 300, but used 252 of them (244 without their having been taught), and made no mention of the other 48 facts.

A similar situation exists in the case of the 80 higher decade facts required for carrying in multiplication.

Text A taught 0 of these 80, but used 60 of them without any previous teaching, disregarding the remaining 20.

Text B taught 0, but used 45 without teaching them; and omitted completely the remaining 35.

TABLE I

SHOWING THE OCCURRENCE OF NECESSARY ADDITION FACTS IN FIVE TEXT SERIES *

	A	B	C	D	E
Primary facts:					
Taught	94	100	100	100	100
Used	100	100	100	100	100
Decade facts:					
Taught	8	0	18	300	8
Used	126	197	264	300	252
Multiplication facts:					
Taught	0	0	2	80	1
Used	60	45	80	80	80
Facts beyond usage:					
Taught	0	0	2	0	6
Used	92	214	22	0	131
Teaching groups	12	3	8	10	6

* Columns A, B, C, D, E in this table refer to five addition drill services. The five text series are given here, but not in the same order as they appear in the table. They are: The Iroquois, the Triangle, the Fowlkes and Goff, the Wilson, and the Strayer-Upton.

Text C taught 2, but used all of the 80, 78 without having taught them.
Text D alone taught the full 80 and used all of them.
Text E taught only 1, but used all 80, 79 of them without teaching.

The summary with relation to the complete group of 480 facts follows:

Text A taught a total of 102 facts, used 286 (184 without any teaching), and omitted the other 194.
Text B taught 100, used 342 (242 without any teaching), and disregarded the remaining 138.
Text C taught 120, used 444 (324 with no previous teaching), and left out the other 36.
Text D taught the complete group of 480 facts and used the full number.
Text E taught 109, used 432 (323 of them without teaching), and omitted the remaining 48.

Table I gives the summary in regard to the facts beyond business and social usage, which should be omitted from a text in the fundamentals. Yet a glance at the table reveals that Text A taught 0, and used 92 without any teaching; Text B taught 0, and used 214 without any teaching; Text C taught 2 and used 22; Text D alone taught 0, and used 0; Text 5 taught 6 and used 131.

In regard to the teaching groups in the same table, it should be noted that too few teaching groups denote too much material taught at one time, where a majority of the facts have been included in the teaching; or it may denote that not enough of the facts were taught, as seems to be the case in the majority of the texts included in this summary.

This brief report of four sizable studies will serve to indicate the possibility, at least, of knowing what is in a textbook before its adoption. General once-over views must be replaced by specific checking.

ARITHMETIC "ON ITS OWN"

MATTIE GRAHAM

Teachers College of Connecticut, New Britain

In our endeavors to develop social consciousness and direct learning activities through units of interest, where shall we place arithmetic? Educators seem to agree that the mere acquisition of concepts does not give sufficient command of arithmetical processes to meet the needs of the average child of school age. We must give some attention to definite achievement in order to equip the children with a reasonable facility in thinking and working in terms of arithmetic.

The modern school places emphasis on the integrated program and intelligent coöperation on the part of the group. "School training will become more far-reaching in its effects when the ends of teaching seek to control the future mental life of the child as well as the present. The study of psychology is one thing and the application of the principles of psychology to teaching is precisely another." [1] Teachers are trying to bring about the development of an ability to adapt oneself to a new and ever-changing social order. They see there is a necessity for putting attention on real life situations.[2] We debate upon which subject we shall adopt as our core (if I may

[1] Newcomb, Ralph S., *Modern Methods of Teaching Arithmetic*, p. 47.
[2] Wilson, Guy M., *What Arithmetic Shall We Teach?* pp. 129-136.

use that rather time-worn term) around which to group or build the other subjects. The science teacher would have science the main subject about which others would center; the social studies department places social studies as the center of interest; while music supervisors, art instructors, and directors of physical education claim some honor for their fields. They may be right to a certain extent, but the important thing to keep in mind is that the child is the "fundamental unit." [3] Social studies and science seem to lend themselves more easily to the unit type of work than do some other subjects.

Extremists in the social studies field say that all the arithmetic needed by children can be developed in the social studies program. As yet, I have not been able to teach arithmetic effectively in this type of set-up alone. I have tried, even though I have not been won over to the belief. It is quite possible that I have not gone about it the right way. Some of my most enthusiastic student-teachers try a far-fetched program of this type but soon discover that it does not meet the needs of the children in arithmetic.

Arithmetic seems to run best on its own feet, with units of its own. "Utility in the common affairs of life" [4] is our justification for teaching arithmetic as arithmetic. This does not mean that a well-planned unit in arithmetic cannot be successfully worked out in connection with some social studies units. Sometimes it fits but often it doesn't. Arithmetic need not be considered an isolated subject, for it enters into life in many vital situations. However, before arithmetic can be of much service, children must be able to use it in its simpler phases with a reasonable degree of efficiency.

This efficiency can be developed only through a systematic method of training and drill. Drill is not a fashionable word in our modern order, but it is nevertheless present in the process of learning arithmetic no matter how cleverly it is disguised by means of "games," "races," etc. Scientific investigations [5] have proved the value of well-planned and systematic drill. Some things are fixed to the extent that we cannot change them. We may change our methods of teaching as often as we wish, but 2 plus 2 makes 4 now just as it always has. We cannot "create" a new fact in arithmetic any more than in art we are able to "create" Egyptian architecture. These things are fixed. The only opportunity we have here for self-expression or creative expression is in the way we use these facts after a knowledge of them has been acquired. This opportunity should of course be seized whenever and wherever possible.

We are trying to train our student-teachers to become efficient in an activity school where various units of work are carried on in an integrated program. We find that arithmetic fits into the activity school very easily, but the term "activity" is not necessarily limited to physical activity. The greater amount of mental activity in any undertaking, the more successful are the results. We carry on our arithmetic as a separate unit, using systematic drill when needed for developing the necessary skill in the use of fundamental processes. Our arithmetic often fits into larger areas of interest within the group after the children become sufficiently skilled to use it. A felt need for skill in arithmetic on the part of the child in working out his unit, problem, or project is often sufficient motivation for associated drill. "The teacher must use the opportuni-

[3] Irwin, Manley E., "The Integration of the Curriculum Through the Arts," *Educational Method*, 15:191-197 (January, 1936).
[4] Wilson, G. M., *op. cit.*, p. 1.
[5] Buswell, G. T., *Summary of Arithmetic Investigations* (1925), p. 19. Buswell, G. T., and Judd, C. H., *Summary of Educational Investigations Relating to Arithmetic*, pp. 100-112. Wilson, G. M., *op. cit.*, pp. 140, 141.

ties to apply arithmetic in the numerous situations that arise naturally in the everyday activities in the classroom, so that the pupils can see how arithmetic functions in their lives." [6]

Let us suppose the children are trying to get a library for the school. They want to raise money for books. They have a sale of articles they have made. In making the articles, they figure the cost of material. They determine how much wood they need for their book ends, wooden toys, umbrella stands, etc., also how much paint and varnish must be bought. They measure the number of yards of cloth needed to make several aprons, table covers, etc. They appoint committees to buy the materials. All this requires a certain amount of bookkeeping, for the children must keep an accurate account of expenditures or bills to be paid. A publicity committee must be chosen and the articles arranged attractively for sale. Each one must be so priced as to cover the cost of the material used and bring a profit. This requires a knowledge which must be developed in the systematic manner necessary in arithmetic. It requires direct teaching. The ability to make change at the sale, pay all bills, and figure the entire profit is acquired through previous drill in the fundamentals.

Then comes the fitting-up of the library. How much can be spent on tables, wood for shelves, bookcases, etc., and still have money left for books? Thus we have within our unit many problems that require definite arithmetical knowledge and skill. For this reason, I feel our arithmetic units are vital enough to stand alone, not merely to meet the demands of other subject fields.

The separate arithmetic period permits greater freedom in the diagnosis of individual needs, and the application of remedial treatment. The problem unit with high social values can be carried forward by the members of the class who are proficient in drill. On certain days each week, all participate in work on the problem unit regardless of drill needs. Thus there is unity of purpose in class work along with the provision for diversity of needs. This should be true of all subjects having in them elements requiring tool mastery.

[6] Brueckner, Leo J., *Diagnostic and Remedial Teaching in Arithmetic*, p. 261.

A PRACTICAL PROBLEM UNIT IN ARITHMETIC

LOLA COFFEY

Teacher of Sixth Grade, George B. Longan School, Kansas City, Missouri

Early in the fall, the principal of the school talked over plans with the faculty for informing the patrons of the district about the many phases of the school system, including the financial aspects as well as the wide range of educational advantages. This information was to be given through a school program in which the sixth grade, the highest grade in the building, was to present the school costs.

The opportunity to develop in boys and girls concepts of numbers and skills with numbers that function in their daily lives either directly or indirectly does not present itself every day. The following is the way one sixth grade class studied charts and graphs, not for the sake of charts and graphs as such, but as their means of presenting in an emphatic way to a large audience of the school's patrons facts and figures concerning the approaching school tax levy.

DEVELOPMENT OF THE ACTIVITY

The day of the school election was approaching, when the citizens of the city were to vote on the existing school levy. The sixth grade must gather data and prepare material for their part in the school program. Their plans embraced the use of the following topics:

1. Size of the school district in square miles, total population, and school population.
2. Cost value of school plant.
3. Annual cost of schools, including total expenses, permanent improvements and maintenance, and operation covering a period of years from 1921-22 to 1934-35.
4. Items of expense, including such main heads as:
   a. Educational supplies.
   b. Maintenance and operation.
   c. Administration, instruction and supervision.
   d. Permanent improvements.
   e. Special taxes.
5. Educational advantages for every pupil.
6. Number and kinds of schools.
7. Health service, physical education, and public library service.
8. Rate of levy and its distribution in the school system.
9. Cost per pupil in average daily attendance.
10. Comparison with other cities.
11. Added opportunities provided in past twenty years at a lower levy rate.
12. School costs compared with city, state, and federal government costs.

Information about each topic was obtained by the pupils from copies of the "Report of the Superintendent of Schools," and from bulletins printed previous to the election.

Then the problem became one of finding a way of presenting this information so that it would be *interesting, meaningful,* and *emphatic.* How do other people who deal with facts and figures reach the public? The class began an examination of magazines, newspapers, geographies, and other material. It was found that facts and figures are often represented by graphs or charts. It was found also that many kinds of graphs are used and that large numbers have meaning when compared with other

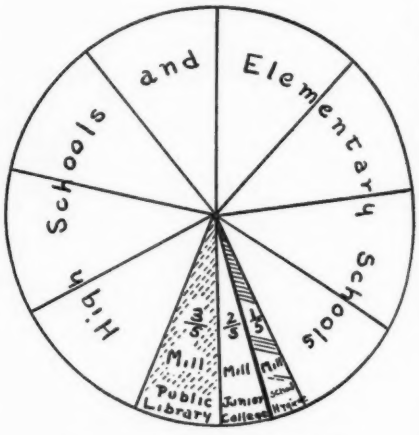
large numbers on a graph. The class then decided that graphs and charts would aid them in presenting the necessary information to their parents.

After the pupils became familiar with different kinds of graphs, it was next decided which items could be clarified by the use of graphs, and the kind of graph best suited to the particular item. At this point the arithmetic text was found to be very helpful, for it gave an illustration of, and problems on, every kind of graph found elsewhere. The explanation in detail of how to construct each was most helpful. In this way the arithmetic text came to be an essential reference book. The boys and girls thought a *line* graph would best show per capita cost per pupil from 1927-28 to 1934-35; a *bar* graph, comparison of the cost per pupil in our city with cost per pupil in twenty other cities; the *circle* graph, distribution of the nine mills among the public library, school hygienists, junior college, and high and elementary schools. The circle graph was also used to show school costs as compared with city, state, and federal government costs. Before making each of these graphs, the class practiced making various kinds of graphs based on problems from the arithmetic text.

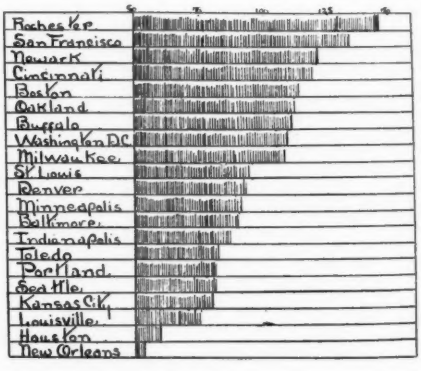
Some of the remaining items of study could best be emphasized by means of charts. These items are as follows:

1. School costs under the divisions:
   Total Costs
   Permanent Improvements
   Maintenance and Operation
   These costs were for the years 1921-22, 1927-28, 1934-35.
2. Fourteen years of schooling for each pupil and number of schools on each level:
   89 Elementary Schools
   4 Junior High Schools
   8 Senior High Schools
   2 Trade Schools
   2 Colleges
3. Distribution of the nine mills for school expenses.
4. Additional schools, colleges, and departments included in the 1934-35 nine mills tax over those of the 1914-15 ten mills tax.
5. Per capita cost based on average daily attendance compared with twenty other cities comparable in population, showing that our city ranked twelfth in population but eighteenth in the amount spent per pupil in average daily attendance.

EXAMPLES OF GRAPHS MADE BY SIXTH GRADE PUPILS



Distribution of the Nine Mills



Cost per Pupil in Kansas City Compared with Cost per Pupil in Twenty Other Cities

After the graphs and charts had been made and all of the assembled information organized into paragraphs, the class concentrated on a suitable conclusion. This was to be a strong appeal. Several quotations on education by outstanding Americans were selected. When their part of the program was written, the children gave it the title, "How the Taxpayer's Dollar Is Spent."

Presentation of the Program

On the evening when the program was given, the entire class sat on the stage during the presentation of their part. Every member participated, and each one did admirably. The graphs and charts were hung on two racks, beside each of which stood a boy who turned the chart back after a speaker had used it. Then came the conclusion, beginning with these words:

> The great, abiding, thrilling reason for schools, is We—Children. Our schools are to insure that we children may have the best opportunity that can be given us to go forth into life to make the most of our lives—to win the greatest possible amount of genuine happiness in life; to achieve the most satisfying success in life; to contribute the finest service to others in life; to make our city what it should be, the best possible place in which to live together, to work together, to achieve together, to be happy together.[1]

The concluding quotation was in the words of Dewey Van Cott, "Future America is now in our schools. What investment is more precious to us?"

Results of the Activity

The scores on the Iowa Reading Test, which was given to check progress in reading, unexpectedly showed most gratifying results in Section III of the test, "Reading Charts and Graphs."

The class became number conscious, handling large numbers with unusual freedom and power.

Long division, involving large numbers, such as 58,105 (divisor) and $6,077,514.33 (dividend) became meaningful and practical.

Practice speeches, prepared in language periods, showed improved ability in sentence and paragraph construction.

Consciousness of their many educational advantages and greater appreciation of their school supplies became evident among the children.

Conclusion

After the program, such reactions as the following were heard from various patrons:

"The most clever entertainment of its kind I have ever seen."

"No speaker could have done a job like that."

"I am sure we shall all vote for the tax levy."

"The children took away the feeling that we were being asked for money."

"The boys and girls know more about how the tax dollar is spent than most grown-ups do."

"Our children are educating us."

During and after the activity the principal heard such remarks as these from the children:

"I had no idea so much money is spent for us."

"It's fun to study and solve problems about our schools."

"Doesn't the Board of Education do a lot for the school children?"

"I did not know so many supplies were used in our schools."

"Tax dollar problems are easy."

[1] Adapted from "Our Schools," *Kansas City School Service Bulletin*, Vol. VIII, No. 2, February, 1936.

THE PURPOSE OF ARITHMETIC

JOSEPHINE L. DRISCOLL

Principal, Sibley School, St. Paul, Minnesota

The original purpose of arithmetic was to aid men in computing for a wanted answer in a business situation intimately known. In the early development of man, barter, the first form of trade, meant merely the exchange of goods. Then, to facilitate trade, money was injected into the transaction as a medium of exchange. The value set upon money made it necessary to estimate prices, figure quantities, measure property, etc., and produced a need and use for number.

So it was that arithmetic entered the schools—a need for adult life. But almost immediately the child was forgotten as a child; he was loaded with facts for future use, according to the teacher's notions. It became generally believed that if he learned verbatim all of the number facts and could accurately perform all of the so-called fundamental operations with them, he would have the background of ability necessary for any application of number he might need in solving problems.

The problems dealt with material mostly foreign to the child and were derived from the experiences of men in various walks of life—the more intricate the better—for developing the logic and reasoning of the young child who might some time in his life meet similar situations. Emphasis was placed upon the development of the so-called faculties of the mind, and arithmetic became a mental discipline.

But results were not satisfactory; many difficulties were encountered during the learning process. And, when put to the ultimate test and measured by the ability to use the accumulated mental product in business situations, the results did not justify the method. In making mental discipline the dominating purpose, we had strayed away from the original purpose—that of computing for a wanted answer in a situation intimately known.

A careful study of that purpose gave us two very important principles upon which to base a better procedure, namely:

1. Arithmetic is a social subject because it deals with experiences of people.
2. These experiences produce the need of number; in other words, the use follows the experience.

This leads us to the conclusion that the true purpose of arithmetic in our schools is to provide the child with meaningful experience out of which will grow the need of number and the opportunity to apply it.

The beginning of number should be a language situation in which the child talks and reads words which represent number and number relations, which give him a background of understanding and the meaning and use of terms. Many interesting situations arise in a child's everyday life which lead to an intelligent use of an arithmetic language. He talks about his trip to school, the number of blocks he travels, the number of times each day he makes the trip, also the number of days each week. He has companions on the way, several, or a few, or perhaps definitely two or three.

One of these companions may be taller than he, and another shorter. One may wear larger shoes and another a smaller coat. One of them may live farther from school than he does and travel a longer distance.

He talks with interest about his own family, which contains a definite number of people. These family members vary as to size and age. Some are older, some perhaps younger.

At school he is a member of a group; he passes materials to the group or places chairs for them, and so he needs to know definitely how many there are in the group.

He has possessions of his own. His supplies become less as he uses them and more as he replenishes his stock. He reads from a book whose pages are numbered for his convenience; as he advances from page to page, the advance is noted by larger numbers. He plays games in which his progress is shown by his score.

He makes simple purchases and for each article bought he pays a definite amount. He is encouraged to report such purchases and tell whether or not he had the exact amount of money required, or whether he received change.

The use of scales in the schoolroom gives number a personal relation to him. When he is weighed and measured, the number of pounds shown by the scales is his weight and the number of feet and inches, his height. He then wants to compare his weight and height with those of his companions. And so on, indefinitely, he interprets his own living through the use of number and number relations.

These everyday experiences, both inside school and out, establish habits of thinking that easily call for the application of number facts. As he reads and talks, he has the number facts before him and reads them into the situation. Number combinations (addition, subtraction, etc.) are given or told to the child, not counted out nor rationalized.

How do we fix telephone numbers in our minds? Do we memorize the directory because some time we may need to call one or more of the numbers? Or do we consult the directory for the occasional ones we need? Do the ones that we use frequently fix themselves in our minds and become automatic? We know that they become fixed by using them and not by trying to memorize them. Do we try to rationalize why the grocer's number is this and the druggist's that? Could we, and what would we have accomplished if we did? We accept the numbers because they are of service to us.

The modern business man in present-day methods equips himself with self-helps. He doesn't guess. He consults a calendar for dates, a directory for addresses, and the latest price list for his sales. He studies the daily papers for quotations on stocks and bonds. The traveler carries a map in his car for ready reference. The druggist concocts medicine from the doctor's prescription—would we prefer that he tried to do it from memory? The successful man today is not the know-it-all, but the one who has data for reference and has been trained to use them. Why must the child be required to memorize facts before he needs them?

As the child goes on in the grades, there is an increasing need of number for the interpretation of experience. The building of a toy store is one which has many possibilities. The materials used in building are measured, the articles for sale are weighed and valued, and present many problems. Here is a splendid opportunity for correlation of subjects. The actual building may be the work of the social science class and the subject treated as a community need. The discussion of the building and the problems presented provide splendid material for the language period. The problems are

solved in the arithmetic class—and the results are turned back as of value in the building. This helps to make the activity take a real hold on the life of the child, as he is computing for answers in situations intimately known.

After the store is completed, the use of it provides a background for buying and selling, and toy money is introduced. Here the imagination of the child plays a part, and this is a very valuable contribution. Dramatization—the play's the thing—provides the necessary activity. The use of dramatization helps the teacher to direct the proper balance between the activity itself and the application of number.

In the upper grades, also, much use can be made of units carried on in other subjects, and many business situations can be effectively dramatized to make the background for the problems to be solved. Pupils of this age should be encouraged to bring to the class for solution any personal experiences which require the use of number.

As we proceed to the work in the upper grades, there is an increasing tendency to get away from the real purposes of arithmetic. The theory is that too much foreign material crowds out the arithmetic itself. It is true that the first step toward civilization was division of labor, and that pupils of today are to live in a civilized world, where each does not build his own sidewalk.

It is not entirely necessary that each child build a sidewalk to provoke the need of solution; neither is it desirable that the child's figuring shall be confined to the meaningless isolated problems of the text. The pupil should be directed to measure the amount of material required, secure current prices for material and labor, and find the actual cost of a particular sidewalk at his home, at his school, or in his neighborhood. Or, better still, the situation may be dramatized. One child owns property; he needs a sidewalk, and advertises for bids. Several submit estimates; others are dealers from whom supplies are bought; others are laborers whose services are bargained for; others form a building committee to judge the estimates. When the work is let, the owner assumes an obligation; he wants to know in advance the exact amount of that obligation—hence, the need of solution. The dealers and workers want to be paid according to materials or services rendered—hence, the need of solution. Accuracy takes on a different meaning when personal wants are to be satisfied.

The purpose of school is to integrate the child into society. When he steps out into the world, he must be able to cope with the world as he finds it at that time—not as he hoped or expected it would be. He will be a success only if he can make adjustments to an ever-changing world. School should be a training ground in providing experiences which give a child opportunity to make adjustments to his own contacts. The experience provided must be meaningful; in arithmetic it must be number-provoking, so that the solution satisfies a want. This procedure puts the solution in its proper place—it is merely a means to an end.

THE CLEARING HOUSE

ARITHMETIC GAMES

The following is taken from a supervisory bulletin sent out to her teachers and principals by Miss Ruby Minor, Director of Kindergartens and Elementary Education, Berkeley, California:

As arithmetic games are favorite devices in learning and reviewing drill facts, the following bulletin represents an effort to guide this tendency in wholesome channels:

Essentials of a Good Game in Arithmetic

1. The game must be within the child's experience and motivated by a real play spirit, a desire to win.
2. The more pupils participating in the game, the better.
3. A game should teach the facts or skills intended.
4. The character education involved should receive consideration.
5. The game should hold the animated interest and attention of the pupils.
6. The game should be a challenge to good thinking.
7. There should be variety in games used or in the same game, if continued.
8. The game should provide for rapid responses.
9. There should be a definite goal in every game to be reached by an individual or a group.
10. Each child should have a clear understanding of the game.
11. Planning by the class, when possible, adds to the interest in the game.
12. Games should contribute to the following abilities in the pupils:
    a. To give commands.
    b. To obey commands.
    c. To keep neat and accurate scores.
    d. To compare results.
    e. To coöperate with the group.
    f. To learn the specific responses desired.
    g. To respond quickly and accurately.

POINT OF VIEW FOR TEACHERS OF ARITHMETIC

Mr. J. C. Parker, Director of Curriculum and Research, Fort Worth, Texas, has the following statement on "point of view" in his recent bulletin on the curriculum in arithmetic, Grades IV, V, and VI:

All thinking, planning, and experiencing relative to public school mathematics must be predicated upon a consciously formulated conception of the function of the school. It is the responsibility of the school to make it possible for each child to become increasingly effective in meeting situations with which he is and will be confronted. This dictates a point of view that makes necessary careful consideration of the contributions that the child's school experiences with quantitative thinking make to his effectiveness in actually meeting situations.

In the selection of experiences and content this necessitates placing relatively more emphasis upon the extent to which direct contributions are made to socially intelligent living in the contemporary world rather than upon some logical organization.

It must be recognized that the mechanics of mathematics, accuracy of computation, and quantitative thinking are so closely allied that they cannot be separated in practice. The most significant consideration must be the development of meaningful concepts and ability to use them accurately in everyday situations. The development of meaningful concepts and ability to use them in everyday situations will not result from trusting to transfer. Procedure must be based upon awareness of purposes by both the teacher and the pupil. All attempts to achieve these purposes must be direct, as transfer is secured only when it is taught.

Arithmetic has been and is conceived as a system of quantitative thinking including facts, concepts, principles, and processes. It is certainly to be considered more than a set of specific skills and facts. The skills and facts are a part of a functioning mode of

thought, the thought involving number and space concepts. This means that arithmetic instruction must be based upon a point of view which accords meanings the most significant rôle, as thinking is impossible without meanings. The vital problems in the arithmetic program must become the determination of the essential meanings and the discovery of ways and means of making it possible for the child to grow in his understanding of, and ability to utilize, these meanings. Satisfactory solution of these problems will require resorting to definite teaching, to incidental teaching, and to drill. In all activities it is imperative that the teacher remember that there is but one way for the individual to learn to think effectively in quantitative situations—through practice and guidance in that kind of thinking in normal and natural situations.

ARITHMETIC LOAD

The following is from a fall circular by Miss Helen J. Piper, Supervisor of Grades IV, V, and VI, Lynn, Massachusetts:

What Is the Arithmetic Load in Any Grade?

To how many of you does this have a familiar sound, "I simply cannot go on with the regular work for my grade because my pupils are not *up* on the fundamentals"—the annual September plaint of the middle grade and junior high school teacher? Shall we take teaching on faith and expect children to be *up* on the fundamental processes without regard to the load they have been asked to carry or the way in which they are taught to accomplish that load? Should teachers expect that no reteaching of the fundamental processes is necessary—perhaps reteaching from the very beginning of the drill work?

In a well-organized school a fifth grade child who cannot read perfectly simple second or third grade reading matter is retaught the elements of reading; and a sixth grade child whose writing is below 60 on the Ayres Scale is given special help in writing. So, why should not a fifth or sixth, seventh, or eighth grade pupil who makes mistakes in simple addition, subtraction, multiplication, or division be taught these processes until mastery is attained?

As to the load, a child should know what his work is to be; that it has limits and does not go on indefinitely. Four hundred simple facts are needed for ordinary addition, and the process difficulties are few. In subtraction there are only one hundred facts, and in multiplication to 9 x 9, only one hundred facts. These six hundred facts of addition, subtraction, and multiplication, along with process difficulties, are the drill load through grades three and four. In grades above the fourth, mastery is checked and review provided.

As to method, the work should be so organized that a child can succeed. This means that he shall have reasonable immediate goals and that the method be one that he himself can manage. A teacher must learn to teach for mastery. She must know the facts and process difficulties. She must know how to observe the working of the child's mind, how to detect his errors, and how to give corrective aid. Incidentally, she must forget the usual norms of standardized tests in arithmetic; these are misleading and harmful; the average the country over, or even the eighty percentile, must be rejected as a standard. In simple tool materials, the perfect score is the only right standard.

EDITORIAL COMMENT AND REPORT

ARITHMETIC IN THE SCHOOLS

According to Payne in 1905, and Holmes in 1914, about one-sixth of school time in larger cities and towns was being spent on arithmetic. Ayers' study after the World War showed slight reduction in this time. It is probable that even today, in all schools, more time is devoted to arithmetic than to any other single subject.

According to Judd in the St. Louis and Grand Rapids school surveys, arithmetic was causing more failure than any other subject in those school systems. Today, the country over, arithmetic no doubt causes more failure than any other subject, although in progressive schools the tendency has been to defer drill in arithmetic to Grade III and to omit many of the traditional and useless processes.

This issue of EDUCATIONAL METHOD calls attention to the possibility of greatly increasing the efficiency of work in the field of arithmetic. More and more, teachers are extending number and business experience and are developing a need before systematic teaching. The drill load is being reduced to that which is useful enough to justify drill.

It is interesting to note the emphasis upon written problem work in the articles submitted for the present number. No phase of school work, perhaps, is so poorly done as the written problem work in arithmetic. It is traditional, useless, if not actually detrimental in its total effect. The remedy, however, is known and is fairly simple.

A word of appreciation is due to those who have coöperated in making the present number possible. From all parts of the country have come suggestions, help, and contributions. There have also been indications of plans for further work on the curriculum in arithmetic—plans that include thorough study, coöperative experimentation, and a determination to solve the problem in the light of children's interests and adults' needs.

GUY M. WILSON,
Boston University.

THE NEW YEARBOOK

The current yearbook [1] of the Department of Supervisors and Directors of Instruction is not only of value in itself; it reflects advance in our thinking about supervision and it marks a new phase in the general program of publication by the Department.

Supervision has, for a long time, been concerned almost exclusively with the improvement of classroom technique. The supervisor was a person assigned to the task of seeing to it that each teacher in a building or a system did her work in the right way. Model lessons were popular. Teachers were eager to catch the secret, to see just how it was done. The supervisor proceeded, as has been well said, to make the teacher over in her own image.

The Development of a Modern Program in English is concerned not so much with the teacher's personal behavior in the individual classroom as with the language experiences of the pupils in the school as a whole. The emphasis has been shifted from "method" to "curriculum," from the art of conducting recitations to the problem of planning a wholesome, stimulating program of educative activities in a favorable environment. The supervisor is to function not so much as a superior technician as she is to serve as a leader and guide to coöperative group action.

[1] *The Development of a Modern Program in English.* Ninth Yearbook, Department of Supervisors and Directors of Instruction, National Education Association, Washington, D. C., 1936. Pp. 208. $2.00.

This is indeed not new in the practice of many progressive supervisors, but it is opposed both to traditional and still often expressed views of supervision and to recent attempts to develop "curriculum making" into a distinctly separate specialty in the profession. Good supervisors have commonly borne chief responsibility for organizing and reorganizing the programs of activities in the schools in which they work. They have recognized the desirability of unifying the efforts of teachers, principals, and general staff members and have never been deceived into thinking that improved practice can be attained by formal courses of study alone, no matter how skillfully devised.

In the second place, we may note that this yearbook is the first offered by the Department in a subject matter field. The National Council of Teachers of English collaborated in its production, and the report of the Council committee, *An Experience Curriculum in English,* is reviewed and commented upon at length in this yearbook.

Some of the radicals will object, of course, to this attempt to deal with a certain area of experience by itself. In fact the relationships of language activities to other activities are given far more than passing mention in the yearbook. They are concretely described as they may actually be found in a modern school. But to insist that English cannot properly be singled out for special study either by school pupils or by educators is absurd. The fact that one writes of the program in English does not necessarily imply that he favors an isolated formal program. In the present instance it clearly does not.

Members of the Department have been eagerly awaiting this new statement of principles and policies in a major field of learning and will no doubt be gratified to have the completed work in hand. Delay in its completion was vexing, but it was unavoidable.

SILVER ANNIVERSARY OF THE ENGLISH COUNCIL CELEBRATED

The National Council of Teachers of English held its twenty-fifth annual meeting in Boston, November 26-28. The Council was organized in Chicago December 1, 1911, and has grown from a membership of 65 at the initial meeting to 5,000 individual members, with 10,000 more in the affiliated state and local groups. The registered attendance at the recent Boston meeting was nearly 2,000.

Seventy-five speakers were named in the program, which provided for two general sessions, a convention banquet and convention luncheon, as well as ten sectional conferences and seven group luncheons with programs. All the leading publishers presented exhibits of their books for work in English, and the local schools offered samples of pupil activities. Harvard University served tea, and provision was made for sight-seeing trips to Concord and elsewhere.

Among the special features of the program were an address by President Lewis of Lafayette College on "American Youth and Their Problems," readings from his poems by Robert P. Tristram Coffin, an address by Padraic Colum on "Poetry and the Modern World," and another by Phyllis Bentley, the British novelist, on "Character from a Novelist's Point of View." Conferences on motion pictures and on radio were held, and a radio broadcast was demonstrated. There was also a demonstration of choral speaking by a choir from Wellesley College.

At the general session on Friday morning, former presidents were platform guests of the Council. A life membership was presented to Professor James F. Hosic, the founder of the Council, who spoke on "New Occasions Teach New Duties." At this session a brochure on the history and achievements of the society was distributed.

The next annual meeting will be held in Buffalo. The new president is Professor H. D. Roberts, of Stanford University.

THE PROGRAM AT NEW ORLEANS

The Department of Supervisors and Directors of Instruction and the Society for Curriculum Study will hold two joint sessions for discussion of the 1937 yearbook, in the preparation of which these two organizations are collaborating.

Saturday, February 20, 9:30 A.M.

THE JOINT YEARBOOK ON THE CURRICULUM, I

Rudolph D. Lindquist, President, Department of Supervisors and Directors of Instruction, presiding

I. The General Plan of the Yearbook
Henry Harap, Ohio State University

II. Recent Curriculum Trends
Presentation: Harold Hand, Stanford University
Critique: Ernest Horn, State University of Iowa

III. Issues in Curriculum Development
Presentation: Will French, Superintendent, Long Beach, California
Critique: George S. Counts, Teachers College, Columbia University

IV. The Philosophy of the Curriculum
Presentation: Laura Zirbes, Ohio State University
Critique: William H. Kilpatrick, Teachers College, Columbia University

V. Planning for Curriculum Development
Presentation: Paul T. Rankin, Detroit, Michigan
Critique: Sidney B. Hall, State Superintendent, Virginia

Saturday, February 20, 8:00 P.M.

THE JOINT YEARBOOK ON THE CURRICULUM, II

Hollis L. Caswell, Chairman, Society for Curriculum Study, presiding

VI. Organizing Educational Forces for Curriculum Development
Presentation: E. O. Melby, Northwestern University
Critique: H. B. Bruner, Teachers College, Columbia University

VII. The Criteria for the Evaluation of Case Studies of Curriculum Development
Presentation: C. W. Knudsen, George Peabody College for Teachers
Critique: C. L. Cushman, Denver Public Schools

VIII. Case Studies of Curriculum Development in Schools
Presentation: Prudence Cutright, Assistant Superintendent, Minneapolis
Critique: Julia Hahn, Public Schools, Washington, D. C.

IX. Case Studies of Curriculum Development in Classrooms
Presentation: Edith Bader, Assistant Superintendent, Ann Arbor
Critique: I. Jewell Simpson, Assistant State Superintendent, Maryland

SECTION MEETINGS

Monday, February 22, 9:30 A.M.

I. The Art Program of the Public Schools
Chairman: Jane Betsey Welling, Head of Department of Fine Arts, Wayne University, Detroit

II. The Coöperative Group Plan and Supervision
Chairman: James F. Hosic, Professor Emeritus of Education, Teachers College, Columbia University

III. Evaluation as a Function of Learning, Teaching, and Supervision
Chairman: Charles C. Weidemann, Associate Professor of Education (Mathematics), University School, Ohio State University, Columbus

IV. Studies of Growth and Development of Children in Laboratory Schools
Chairman: A. R. Mead, P. K. Yonge Laboratory School, University of Florida, Gainesville

There is also scheduled for Monday afternoon a discussion, illustrated with slides, on "Adolescent Maturation—Its Implications for Education," under the direction of Dr. Herbert R. Stolz, Assistant Superintendent

of Schools, Oakland, California. Details of this conference, attendance at which will be by invitation only, will be mailed to members of the Department shortly.

The Department Luncheon

Time: Tuesday, February 23, at 12:30 P.M.

Place: Jung Hotel, Roof Garden

Theme: The Future of Supervisory Programs

Price: $1.50. Tickets may be secured in advance from Department headquarters at Washington, and will also be on sale at New Orleans. Early reservation is desirable.

A SPECIAL INVITATION

There has come to the Editor's desk a special invitation from the Orleans Parish School Board to the readers of Educational Method to attend the meeting in New Orleans. This invitation, signed by Isaac Heller, Chairman of the Board, Caroline S. Pfaff, District Superintendent, Virginia Camp, high school instructor, Margaret Powell, Louise Averill, Mary Dolphin, and Helen Hiller, elementary teachers, is in verse form and we are glad to print it here:

Come to New Orleans!

Our flowers are bright and fragrant when
God washes the world with rain;
Our mocking-bird sings sweetest when
love lightens his refrain;
Our live oaks, gnarled and buttressed,
stand sturdy, staunch and true,
With tongues to tell of romances, past and
present, too.
From stream and lake and bayou, and
from our little brooks
You'll learn the grandest lesson not found
in common books;
In the stones that took a journey to pave
our narrow street
There is a wondrous sermon for him with
ear to greet;
With nature all about us that breathes per-
petual spring,
For eyes that see and ears that hear, there's
good in everything.

Come to New Orleans!

HEADQUARTERS NEWS

Notice of Amendment to the Constitution of the Department

The transfer of the Department office to Washington and the placing of a special secretary in charge of it, together with the consequent redistribution of functions of secretary, treasurer, and editor, have made certain changes in the constitution and by-laws of the Department of Supervisors and Directors of Instruction necessary. The amendments required will be prepared by the Executive Committee, discussed by the Board of Directors, and presented to the Department at the annual business meeting in New Orleans.

State Branches

We are anticipating that several state associations of supervisors will want to affiliate with the national Department of Supervisors and Directors of Instruction in the near future. Miss Eliza Kelly Stickley, newly elected president of the Virginia supervisors, has transmitted to us the request of her group for affiliation, and the matter will be voted upon at the New Orleans meeting. Miss Helen Heffernan reports that the supervisors of California are eager to organize a state branch. Representatives of other state groups who are interested in such affiliation may write to the headquarters office of the Department for information as to procedure.

Recent Additions to List of State Representatives

The chairman of our Promotion Committee reports the following new appointees:

Colorado: Mr. Gilbert S. Willey, Principal, University Park School, Denver

Maryland: Miss Myrtle Eckhardt, 105 South Centre St., Cumberland

MINNESOTA: Miss Ruth Moscrip, Teachers College, Saint Cloud
MISSOURI: Mr. C. A. Phillips, Director, University Elementary School, University of Missouri, Columbia
NEW JERSEY: Miss Ella J. Hamilton, School Administration Building, Atlantic City
NORTH CAROLINA: Miss Ruth Fitzgerald,[1] Woman's College, University of North Carolina, Greensboro
OKLAHOMA: Miss Pearl Scales, Director of Grades, 400 North Walnut Street, Oklahoma City
WASHINGTON: Miss E. Wilma Trent, Supervisor of Intermediate Grades, State Normal School, Bellingham

REPORTS FROM THE FIELD

The Department of Elementary Supervisors of the Virginia Education Association met at Richmond, November 23 and 24, with Mrs. Elsie A. Davis presiding. "Guiding Individual Child Growth" was the theme of the meeting. During regular school hours on Monday, the supervisors were permitted to visit city schools in Richmond and Williamsburg and rural schools in Henrico, Essex, New Kent, and Dinwiddie counties. This opportunity was greatly appreciated; each supervisor visited the type of school in which he or she was most interested—from the one-room to the large consolidated school. In the evening an excellent cultural program was enjoyed, with Mr. Luther A. Richman, State Supervisor of Music, talking on "Music as a Part of the Instructional Program" and Miss Nancy Byrd Turner giving "Adventures of a Verse Writer."

The Tuesday morning session opened with words of greeting by Mr. E. E. Worrell, State Supervisor of Rural Education. Two interesting panel discussions followed, with eight panel members participating in each. One group discussed "Developing a Broader Conception of the Meaning and Use of Subject Matter" and the other, "Creative Expression an Evidence of Child Growth." The two-day convention ended with a dinner Tuesday evening, at which Dr. Edmund deS. Brunner of Columbia University spoke on "Recent Social Trends and Their Educational Implications."

Miss Eliza Kelly Stickley of Henrico County was elected president of the Association for the coming year.

Mr. Harold Bright, of Indiana State Teachers College, has sent us the following:

A conference of directors of student teaching, supervisors, superintendents of schools, principals, critic teachers, and others interested in the improvement of teacher education was held at North Manchester, Indiana, November 20-21. The theme of the conference was: "How may the critic help the student teacher make his observations more meaningful?"

Dr. Florence Stratemeyer of Columbia University was the guest speaker. Her work was of the highest order, combining the inspirational and the practical. This is attested by the fact that many who had come with the idea of attending only one day's conference remained for the following day. Panel discussions were participated in by persons interested in the various fields of education, together with student teachers from Manchester College. Participation by these students was one of the high lights of the meeting.

In a letter recently received from Miss Mable E. Cummings of Rapid City, South Dakota, she says:

The dinner meeting for the state organization of principals and supervisors was one of the most inspiring I have attended. After the musical numbers, Dr. J. M. Glass, Professor of Education at Rollins College, Florida, gave an informal talk on improving the relationship between principals, supervisors, and parents. His suggestions were practical and thought provoking. Opportunity was given for questions and discussion.

[1] In place of Miss Ada Velie, announced in our November issue.

THE READER'S GUIDE

MENTAL HYGIENE IN THE CLASSROOM

Harry N. Rivlin's *Educating for Adjustment*[1] discusses the school and classroom applications of mental hygiene. Unlike many books on personality problems, it is addressed especially to teachers and principals rather than to specialists in child guidance. The author is more interested in fostering desirable personality development in *all* children than he is in correcting the extreme behavior difficulties of a few. This does not mean that mental and emotional problems are ignored. Rather, the problems discussed are those manifested by so-called "normal" children. The author insists that teachers have no business attempting to diagnose and treat those unusual cases which need psychiatric study and treatment. He is equally convinced that the well-adjusted and well-informed teacher or principal can and should help most of her pupils to make increasingly better adjustments. Ways of accomplishing this purpose are presented as simply and directly as the complexities of the subject permit.

The first five chapters are devoted to the difficult task of explaining, in language intelligible to the average reader, the psychological and psychiatric principles which underlie the modern attitudes of mental hygienists toward the personality problems of children. Especially helpful is the evaluation of different points of view, such as those of Freud, Adler, and Jung in the field of psychoanalysis, of Adolf Meyer and psychobiology, and of the behavioristic and the Gestalt schools of psychology. The author is no pleader of a special cause, unless it be that of a comprehensive view of the factors and processes in personality adjustment. Without partiality he undertakes to show the values and limitations of each viewpoint discussed, not in theoretical terms alone, but in terms of its utility in the guidance and training of children. His conclusion is that the teacher must not proceed on the basis of any one limited theory of behavior, but should utilize the contributions of several. She must not expect to find only a single cause underlying any behavior problem, but should look for a number of contributing causes.

The next five chapters deal with a variety of factors which affect pupil adjustment. The child's intelligence, his physical condition, conflicts between home and school, the economic status of parents, neighborhood conditions, recreational opportunities, and religious experiences are discussed with emphasis on how the school can help to relieve the emotional strains which such factors often produce, and how it can utilize favorable factors in the constructive development of pupil personality. An entire chapter is devoted to the problems of sex adjustment and sex education.

A third section of the book is concerned specifically with methods of teaching and of classroom management as they affect pupil adjustment. Sound discipline, the use of incentives, and the values and limitations of classroom punishments are treated at length. One chapter is devoted to methods of teaching that retard adjustment, and another to methods of teaching that facilitate adjustment. An unusually fair appraisal of so-called "progressive education" with respect to its effect upon child adjustment is given. In these chapters the author compares and attempts to reconcile the often divergent at-

[1] Rivlin, Harry N., *Educating for Adjustment.* D. Appleton-Century Company, 1936.

titudes of the typical teacher and the typical psychiatrist toward certain classroom procedures.

The closing chapter stresses the importance of the teacher's own satisfactory adjustment, and suggests ways in which it can be improved. This discussion should be helpful to school administrators as well as to teachers. The author contends that the school's philosophy of administration, and especially the principal's attitude toward his teachers, are potent factors in every teacher's personal and professional development.

Although the book emphasizes the positive aspects of personality development, nearly every chapter contains examples of problem behavior with suggestions for their analysis and treatment. At no point, however, is the reader confronted by detailed case studies of maladjustments seldom found in the ordinary school. Most of the illustrations will be recognized by teachers as being typical of problems observed in their own classes.

At the end of each chapter is a set of additional problems for study and discussion, as well as a list of selected books and magazine articles with asterisks indicating those likely to be most helpful to teachers. The problems are well chosen and should provoke illuminating discussion, although many of them could hardly be solved satisfactorily without more facts about the case than are given. To answer them adequately the reader must frequently assume the existence of one condition or another which may or may not have been present in the original case. This limitation will not be serious unless it leads teachers to draw conclusions or make recommendations on the basis of inadequate information, a practice against which the author repeatedly warns.

An especially commendable feature of the book is the author's attempt to distinguish between mere opinion and the findings of competent research in regard to personality problems. Without burdening the reader with technical detail, he gives the gist of numerous studies which throw light on child-guidance problems. As the author points out, however, the number of conclusive researches in this field is at present so limited that the teacher must proceed with great caution at many points. While she should utilize expert opinions, she also must suspend final judgment on many procedures until they have been more thoroughly investigated.

If the volume has an outstanding limitation (so far as this reviewer is concerned), it is one that is common to practically all introductory treatments of a complex and difficult subject. Many of the suggestions for the guidance of children are so general that they may be helpful only to the unusually intelligent and interested teacher. On the other hand, perhaps a teacher who could not obtain real help from such a book would be incapable of guiding children wisely under any conditions. In any event, the competent teacher who reads this one carefully will surely be stimulated to pursue the subject further in attempting to solve her own classroom problems.

The author's style is generally clear and easy to read. The material is well organized and concisely presented. The publishers have done an especially attractive job on the typography and general format. From many points of view, the book deserves the attention of every teacher and principal.

RICHARD R. FOSTER
Research Division
National Education Association

LANGUAGE DEVELOPMENT IN ELEMENTARY GRADES

Miss Jenkins' new book on the teaching of language in the elementary school [2]

[2] Jenkins, Frances, *Language Development in the Elementary Grades.* Thomas Nelson and Sons, 1936.

brings to a focus many significant changes in the methodology of this fundamental subject. To one who has followed the scientific studies in this field during the past quarter-century, it is gratifying to note that the findings of research have resulted in a more intelligent view of the process of language teaching. No longer are errors stressed; no longer is the teaching of grammar divorced from needs; no longer are grades more important than growth—if the theory expressed in this volume eventuates in general practice. Life—child life—becomes the beginning and end of language. Speech and writing become the media of actual communication, not isolated, artificial "subjects" for study and practice. Speech, rather than writing, takes its high place in schoolroom activities. Speaking and writing are all-school, all-day matters, not a "period" in the day's program.

One wishes that Miss Jenkins had added a hundred pages to her excellent volume. She could have elaborated often, to the great help of the inquiring teacher, and, especially, of the beginner. She might, for example, have given further attention to the pioneer study of Charters referred to, but not identified, on page 47 and again on page 153. This study of the errors in grammar actually made by school children gave to language teaching a new and vital point of view. Likewise, she might have referred to Dr. Walter Barnes' important investigation of the out-of-school uses of language. This would have reinforced the section on "Conversation in Real Life" (page 74). She could have told us more about standards for creative work instead of saying merely, "standards must be high"; she might have indicated the results of recent studies in spelling, and discussed the use of language tests for diagnostic purposes.

Few traces of pedagogical lingo mar the book. "Functional centers" may puzzle teachers who have not caught up with our technical terminology, as may also the term "special control," used in connection with the college students' records of young children's language (page 165). The context, of course, explains these expressions, but one could wish for less pretentious terms.

Miss Jenkins has presented a wealth of illustrative material representing the work of all grades. Much of this is credible, giving evidence of child language and child thinking, often including actual misspelling and immature sentence construction, but the skeptic wonders about many selections which reveal a polished form that suggests much retouching on the part of the teacher. A description of the process of collaboration in a composition such as the one beginning, "I see a tipsy meadow lark" (page 39) would be illuminating.

It is not clear why creative work should be restricted to the short story, poem, and dramatization. Such forms as essays, sketches, fables, and imaginary biographies give opportunity for creative thinking and imagination. And why must drama in these early experiments have "a plot which is the outgrowth of a clash of wills?" One may also question the dictum that "all story-writing depends either upon real events or upon arranged events growing out of reality." This would seem to forbid fantasy—a kind of writing enjoyed by many children.

But all this fault-finding is caviling. We must be genuinely grateful for a sanely modern treatment of the problems involved in teaching children to speak and write well. The section of Miss Jenkins' book entitled "Practical Illustrations and Suggestions," based largely on actual language experiences, is excellent. So is the comprehensive bibliography. All teachers of language in the elementary school will welcome this stimulating aid to their work.

HERBERT E. FOWLER
Teachers College of Connecticut
New Britain, Conn.

HOW YOUNG PEOPLE MAY SERVE THEIR COMMUNITIES

The first of a new series of educational books undertaken by the Progressive Education Association is a report of community projects participated in by children and young people.[3] The material was collected at the Lincoln School of Teachers College by a W. P. A. research group under the direction of Professor Paul Hanna, who edited the whole. Professor William H. Kilpatrick provided an Introduction on "The Underlying Philosophy of Cooperative Activities for Community Improvement."

The point of view accepted in this volume is familiar to all students of progressive education, though it seems to have become known only within a year or so to those in charge of the C. C. C. Collings gave a fine example of it in his *Experiment with a Project Curriculum*. The meat of the cocoanut is in the accounts of actual experience, with the suggestive comments that accompany them.

A wide reading of this book might increase considerably the number of those who know what the real American Way is. It would do more; it would give material assistance to the public spirited in countless communities who are striving to make life wholesome for both children and adults in a new industrial and economic order. Public safety, civic beauty, community health, agricultural and industrial improvement, civic arts, protection of resources, socially-useful work in foreign countries are chapter headings that excite interest when they are coupled with the phrase, "Youth Contributes."

The work of selection and reporting of experiences has been skilfully done. If the Great Depression is to be thanked for adding this to our stock of live educational literature, then let us praise it for that!

A NEW GUIDE TO MEASUREMENT

The enthusiasm with which Professors Ayer and Engelhardt, general editors, write in their Introduction to Lee's *Guide to Measurement in Secondary Schools*[4] is justified. The book is capital. It contains a wealth of up-to-date information about tests, but it subordinates this to a working program of testing.

No feature of the book is more striking than its complete shift from interest in getting averages of groups to getting the facts necessary to intelligent guidance of the individual. A secondary outstanding characteristic is the balance that is kept between academic attainment and growth of the personality as a whole.

The author has the advantage of having made a study of the current practice of secondary schools in regard to measurement, as well as having worked as a student in an institution in which thorough examination and critical appraisal of all existing test material was possible. Anyone who has not recently canvassed the field will be surprised by the extent of the lists of tests now to be had. Whether the author has given as much aid as will be sought in choosing from among so many instruments is open to question. For one man to undertake to evaluate such a mass of material is of course a large order. Dr. Lee has done as much as could reasonably be expected.

This book is encouraging as indicating that the scientific study of educational problems tends to catch up with the progressive planning of curricula and the newer ways of dealing with pupils. The samples of behavior which can be secured and analyzed objectively are limited in range even yet, but they come much nearer to telling us all we need to know than they did ten years ago. The spirit and intention of this book will commend it to all modern students of

[3] *Youth Serves the Community.* By Paul R. Hanna and others. New York: D. Appleton-Century Company, 1936.
[4] *A Guide to Measurement in Secondary Schools.* By J. Murray Lee. D. Appleton-Century Company, 1936.

secondary schools. It will serve admirably as a guide to both study and practice.

EDUCATION OF YOUNG CHILDREN AND THEIR PARENTS IN RUSSIA

Two women who have given their lives to the task of improving the chances of little children to get a good start in the world have collaborated in writing *Nursery School and Parent Education in Soviet Russia*.[5] Madame Fediaevsky, a Russian, wrote an account in English of the nursery schools and creches in the U.S.S.R. Professor Hill revised the text and prepared an Introduction for it.

In addition to telling about the educational work for small children, this interesting volume treats of: Protection of Motherhood and Infancy, Legislation, Consultation Centers, Research Work, and Health and Education Propaganda. It may be taken, therefore, as an attempt to give a comprehensive view of the policies of the Soviet Union as to child care and protection. Undoubtedly we can learn a great deal from the advanced type of legislation which has been passed for the purpose of insuring the health and well-being of mothers and their small children. Our problems are somewhat different, to be sure, but we can at least make equally thoroughgoing attempts to solve them.

The book is illustrated with a profusion of photographs of children at play, with their mothers at physical examination, asleep in a creche, and so on. The text makes clear that these examples indicate the kind of thing that is being undertaken, not something to be found everywhere throughout the Union. They are, however, not accidental but planned. The reader will find a bibliography at the end of the book, which will enable him to follow up his interest in the educational and humanitarian activities of the New Russia.

[5] *Nursery School and Parent Education in Soviet Russia.* By Vera Fediaevsky and Patty Smith Hill. E. P. Dutton and Company, 1936.

SIGNIFICANT ARTICLES

Curriculum Development in Cities

Continuing its custom of summarizing from month to month the activities of those engaged in curriculum construction and reconstruction, *Curriculum Journal* for November offers a symposium on "Curriculum Development in City Schools." Following an Introduction by C. L. Cushman are articles by Helen K. Mackintosh, Prudence Cutright, J. C. Parker, and William B. Brown. The first two writers are assistant superintendents of schools and the last two are curriculum specialists in school systems. All four attempt to lay down general principles that they believe should be followed in the preparation of courses of study bulletins and in other aspects of modern curriculum development. Miss Mackintosh defines, Miss Cutright calls attention to determiners, Mr. Parker describes current methods of procedure and presents the organization now adopted in Fort Worth, Mr. Brown stresses the importance of leadership. This number of *Curriculum Journal* contains also the "Annual Bibliography of Curriculum Making," by Edgar Dale and Vivian Weedon.

Democracy in Administration

Dean Russell of Teachers College offers in the *Record* for November an illuminating analysis of the nature of democratic school administration and brings this into contrast with the position of those who believe that teachers should join labor unions and that higher institutions should be run by the faculties and other employees. He cites the methods used in France and the United States as examples of two types of democratic administration—government of laws and government of men. He holds that our American way of constituting a board of

directors or trustees answerable to the people, which selects an executive with indeterminate tenure, is more likely to promote the general welfare than either the French method or rule by soviet. He calls attention to the fact that the introduction of unions into the college world would result in the use of union techniques. The administration would, for example, deal with representatives, not individuals; the union would propose candidates, etc. The article contains interesting illustrations drawn from the writer's experience in Siberia.

History of the English Teachers' Organization

The National Council of Teachers of English marks the completion of its first quarter century by publishing in the *English Journal* for December a short account of its inception and subsequent history. It appears that the association grew out of the tension between the expanding high schools and a small group of colleges and secondary schools seeking to establish uniformity of requirements. Instead of attacking the problem of external requirements directly, however, the Council set to work to develop a better program in the schools and gradually reduced the question of college demands to irrelevancy.

The growth of the society has been phenomenal. Starting with sixty at the initial meeting and rising to 200 at the second, it now exceeds 5,000 in individual memberships and has some 50 affiliates. Its most successful publication is its *List of Books for Home Reading,* of which over a million copies have been sold. Its most influential report, *Reorganization of English in the Secondary School,* appeared in 1917. It has at present seventeen active committees, sponsors two official organs, and holds two conventions a year.

A Guide to the Social Studies Report

The leading article in *Social Studies* [1] for November is called "A Guide to the Commission Report." The writer, Professor Wesley of the University of Minnesota, comes to the rescue of an elaborate series of findings that seems to be in danger of dropping out of sight. He compares the report in question with those of 1899, 1911, and 1916, all of which were short and definite. The latest report is voluminous and it studiously avoids anything resembling a concrete program that the schools can take over and follow. Mr. Wesley thinks that anyone who has responsibility for formulating a school program must consider some sixteen aspects of the problem. These he proceeds to analyze and by reference to the Commission Report to relate to the ideas advanced in that document. On the basis of this showing, one may conclude that the Report is capable of assisting in the formulation of general principles even if it does fail to present details. The article also sums up the favorable and unfavorable criticisms that have been made of the Report.

The Integrity of Education

Professor Dewey spoke before the Michigan Schoolmasters' Club in April on the need for unifying educational effort, and a summary of his address is printed in *The Education Digest* for November. We have made remarkable strides in providing an educational plant. The question now is, What are we going to do with it? The meaning of education is to be found in its relation to society outside the school. At present we are confused as to what that society should be. We can, however, reach a fair agreement as to the general direction in which we wish to move. There is conflict between the older aim of accumulation of facts and skills and the newer aim of ma-

[1] This magazine will hereafter be known as *Social Education,* Erling M. Hunt, Editor, 204 Fayerweather Hall, Columbia University, New York, N. Y.

turing the judgment. In theory we emphasize the second, but in practice we follow the first. We need to see this issue clearly and unite in a courageous effort for integrity of education to prevent our division from making us the unwitting tools of those who would use the schools for their private ends.

THE NEW BOOKS

Youth Serves the Community. By Paul R. Hanna and Research Staff. A Publication of the Progressive Education Association. New York: D. Appleton-Century Co., 1936. Pp. 303. $2.00.

Supervision of Social Case Work. By Virginia P. Robinson. Chapel Hill: University of North Carolina Press, 1936. Pp. 199. $2.50.

Teaching Purposes and Their Achievement. By L. John Nuttall. New York: Charles Scribner's Sons, 1936. Pp. 285. $1.80.

Curriculum-Making in the Social Studies. By Leon C. Marshall and Rachel Marshall Goetz. Part XIII: Report of the Commission on the Social Studies, American Historical Association. New York: Charles Scribner's Sons, 1936. Pp. 252. $1.75.

Principles of College Library Administration. By William M. Randall and F. L. D. Goodrich. Chicago: University of Chicago Press, 1936. Pp. 245. $2.50.

Today's Economics. By Harold S. Sloan. New York: Prentice-Hall, Inc., 1936. Pp. 339. Illus. $1.68.

Science. By Ira C. Davis and Richard W. Sharpe. New York: Henry Holt and Co., 1936. Pp. 491. Illus. $1.72.

Descriptive Physics. By Sherman R. Wilson. New York: Henry Holt and Co., 1936. Pp. 231. Illus. $1.20.

Business Mathematics. By Lucien Blair Kinney. New York: Henry Holt and Co., 1936. Pp. 350. Illus. $1.40.

With Puppets, Mimes, and Shadows. By Margaret K. Seifer. New York: The Furrow Press, 1936. Pp. 132. $1.50.

The Birthright of Babyhood. By Clarence Wesley Sumner. New York: Thomas Nelson and Sons, 1936. Pp. 85. $1.00.

The Unit-Activity Reading Series. By Nila Banton Smith. Newark, N. J.: Silver, Burdett Co., 1936. *Near and Far,* pp. 320; illus.; $.76. *Teachers' Guide for the First Year,* pp. 501; $1.20.

Guidance in Reading Series—Child-Story Program. By Grace E. Storm. Chicago: Lyons and Carnahan, 1936. *Nip and Tuck,* pp. 46. *Bob and Judy,* pp. 125. *Good Times Together,* pp. 154. *Neighbors and Helpers,* pp. 332. *Friends About Us,* pp. 248. *Teacher's Guide, Book One,* pp. 306. *Teacher's Guide for Grade Two,* pp. 179. *Teacher's Guide for Grade Three,* pp. 211.

IN PAPER COVERS

How Shall We Educate Teachers and Librarians for Library Service in the School? Joint Committee of the American Association of Teachers Colleges and the American Library Association. New York: Columbia University Press, 1936. Pp. 74. $1.00.

Annual Report of the General Education Board, 1935-1936. General Education Board, 49 West 49th St., New York City, 1936. Pp. 112.

Safety in Pupil Transportation. Research Bulletin, Vol. XIV, No. 5, November, 1936. Washington, D. C.: National Education Association. Pp. 48.

Reading for Complete Living. A Bibliography for High School Pupils. Department of English, Central High School, Newark, N. J., September, 1936. Pp. 64.

Guides to Study Material for Teachers. By Mary E. Townsend and Alice G. Stewart. New York: H. W. Wilson Co., 1936. Pp. 113.

An Evaluation of the Free Reading in Grades Ten, Eleven, and Twelve. By Lou L. LaBrant. Columbus, Ohio: Ohio State University Press, 1936. Pp. 80.

The Process of Learning to Dress Among Nursery-School Children. By Cora B. Key, Margaret R. White, Marjorie Pyles Honzik, Adelia Boynton Heiney, and Doris Erwin. Genetic Psychology Monographs, Vol. XVIII, No. 2, April, 1936. Edited by Carl Murchison. Worcester, Mass.: Clark University Press. Pp. 163. $2.00.